THE PSYCHOSOCIAL BENEFITS OF SCUBA DIVING FOR PERSONS WITH PHYSICAL IMPAIRMENTS

A Thesis

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Master of Science

by

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ABSTRACT

Purpose. This study explored the psychosocial benefits of adaptive scuba diving on adults with physical impairments, while investigating whether conquering challenge within an unconventional environment affects how participants experience barriers during their daily lives.

Method. A convenience sample was obtained by shadowing two dive trips organized by the adaptive dive outfitter Diveheart. Descriptive demographics as well as any psychosocial benefits were measured by collecting data through four distinct measures: 1) demographic questionnaire (quantitative); 2) NEO-FFI scale (quantitative); 3) augmented dive logs (quantitative/qualitative); and 4) semi-structured interviews (qualitative).

Hypotheses. It was expected that participants' confidence, emotional wellbeing, and feelings of equality among their able-bodied peers would increase after scuba diving. Additionally, participants were expected to reexamine the barriers in their lives and discover opportunities for unforeseen interventions or solutions.

Results. When calibrated correctly, scuba diving provides opportunities for appropriate challenge, resulting in increased quality of life, emotional wellbeing, and adaptive behaviors.

BIOGRAPHICAL SKETCH

Katherine (Kay) Pearson received her Bachelors of Arts from The George Washington University in Sociology and Human Services, where she became deeply involved in disability rights and accessible housing. After working in the field for over ten years, she decided to seek her Masters of Human Environment Relations at Cornell University in order to expand her knowledge and increase her impact within the community.

Man often becomes what he believes himself to be. If I keep saying to myself that I cannot do a certain thing, it is possible that I may end by really becoming incapable of doing it. On the contrary, if I have the belief that I can do it, I shall surely acquire the capacity to do it even if I may not have it at the beginning.

-Mahatma Gandhi

ACKNOWLEDGMENTS

I am forever indebted to my advisors David Feathers and Corinna Loeckenhoff, without whom this thesis and myself would remain lesser versions. I am also incredibly grateful for all the financial support I have received from my department, Design & Environmental Analysis, as well as Cornell's Graduate School. Cornell University has provided me with more opportunities than I thought possible, and I can never overestimate its value and impact on my life.

It is also not mere hyperbole to acknowledge that this thesis would never have been completed without the help, generosity, and hospitality of Diveheart. I have witnessed first-hand the impact that their work has on people with cognitive, emotional, and physical impairments, and wish I could do more to support their efforts. If you're financially able, I highly recommend donating to their non-profit by visiting their website: http://diveheart.org/get-involved/donate.

Finally, I want to thank my friends and family for their unconditional support, encouragement, and love.

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LIST OF DEFINITIONS

Adaptive Equipment: Devices that assist people with various functional or cognitive impairments to complete a specific task.

Adaptive Sports: Sports that have been modified to be inclusive of people with various functional or cognitive impairments

Dive Buddy: When scuba diving, a diver is not only responsible for his or her own health and safety, but the health and safety of whom they are diving with as well. This reciprocal pairing is called being a dive buddy to another diver.

Flow: A phenomenon where a person "becomes so engrossed in the activity that nothing else seems to matter, as the person's attention is entirely devoted to the engagement in the activity" (Carin-Levy & Jones, 2007, p. 7).

LIST OF ABREVIATIONS

C-EPM: Competence-Environmental Press Model

D-EPM: Disabling-Enabling Process Model

EMA: Ecological Model of Aging

ICF: The International Classification of Functioning, Disability and Health

NEO-FFI: Neuroticism-Extraversion-Openness Five-Factor Inventory

R-EFM: Recreationist-Environment Fit Model

SCUBA: Self-Contained Underwater Breathing Apparatus

WHO: World Health Organization

1. Introduction

General physical activity has been recommended as a critical component of quality of life, health, and overall wellbeing for people with physical impairments (Motl, et. al., 2009; Mulligan, 2011; Rimmer, et.al., 2004). While empirical research is scarce, the limited evidence for the benefits of adaptive sports on people with physical disabilities is encouraging (Blinde & Taub, 1999; Lundberg, et. al., 2011; Wilhite & Shank, 2009). Adaptive sports have been highlighted as a therapeutic aid yielding increased self-efficacy, self-worth, personal empowerment, and improved body image while reducing stigma and social isolation (Blinde & Taub, 1999; Lundberg, et. al., 2011; Wilhite & Shank, 2009).

Despite these known gains in overall health and wellbeing, 56% of people with physical impairments still do not participate in any leisure-time physical activities (Rimmer, et.al., 2004). This lack of activity has been linked to increases in serious secondary health conditions like diabetes and obesity (Martin, 2013), suggesting that not only are the majority of adults with physical impairments missing out on health benefits from physical activity, they are also potentially contributing to their own health decline through persistent inactivity.

Swimming and other water-based activities are commonly prescribed therapies for people with physical impairments, as water naturally buoys the body, thereby reducing strain and allowing people to focus on strength training and regaining lost mobility (Fleming & Melamed, 1977). While these more traditional therapies provide significant benefits, they may not appeal to everyone. Adventure sports, like scuba diving, not only offer participants a different means to receive similar physiological benefits, but these sports may appeal better to their psychological needs as well (Fleming & Melamed, 1977; Tok, 2011).

While there are many approved methods for breathing safely underwater, recreational divers use open-circuit SCUBA, where divers breathe blended air (21% oxygen, 79% nitrogen) from a supply cylinder and exhaust the spent air into the surrounding water (U.S. Navy Diving Manual, 2011). As Caisson Disease (Decompression Sickness) and Nitrogen Narcosis are

physiological dangers that can occur while diving, dive tables and/or dive computers are used to calculate how long divers can safely remain at various depths before increasing the odds of experiencing these maladies exponentially (*Ibid.*). Caisson Disease occurs when divers ascend too quickly and the pressurized nitrogen present in tissue develop bubbles within the bloodstream, which cannot be removed quickly enough from the body naturally through breathing (referred to as outgassing or offgassing) (*Ibid.*). If this happens, paralysis or death can happen if the bubbles block blood flow to critical organs. Nitrogen Narcosis, once called the "rapture of the deep," occurs when divers remain too deep for too long and begin to have feelings of euphoria, similar to drunkenness, which severely impairs their ability to dive safely (U.S. Navy Manual, 2011). Although rare, divers suffering from nitrogen narcosis can accidentally kill themselves from impaired judgment. When depth and time limits are followed, however, Caisson Disease is avoided 99.3% of the time (Beauprie, 1989), and the symptoms of Nitrogen Narcosis can be alleviated by simply returning to shallower depths. Although it has a reputation as a risky sport, scuba diving is not dangerous when practiced safely. With an estimated fatality rate of 1 out of every 211,864 dives, or stated differently, only 3-6 per 100,000 divers per year (Divers Alert Network, 2010), a diver is 10 times more likely to die in a motor vehicle accident than in the water (Beauprie, 1989).

After analyzing diving accident statistics, Beauprie (1989) determined that there are seven health categories which correlate highly with diver morbidity or mortality: 1) breathing problems like pneumothorax, asthma, or emphysema; 2) obesity or poor physical conditioning; 3) potential blood flow obstructions like cardiac shunts, polycythemia, or sickle cell disease; 4) any condition which might cause vertigo; 5) some conditions which may result in random loss of consciousness; 6) routine poor judgment or psychoses; and 7) pregnancy. When a diver is known to have a significant physical impairment, however, seven additional factors should be taken into consideration: 1) all respiratory muscles should operate independently without any aids; specifically, any spinal lesion should not exist above T5, but preferably not above T8; 2) the

skin should not have any open wounds, sores, or unhealed scars; 3) there should be no active urinary infections, and divers should have complete control over urinary and bowel movements whether independently or with the assistance from medical aids; 4) if paraplegic, the injury should not have been caused by a previous incidence of decompression sickness; 5) if spinal lesions are incomplete, the diver should be warned that the lesion could become complete (although this has never been recorded); 6) the individual should be a strong swimmer; and 7) the diver should understand and respect the limits of their abilities (Fleming & Melamed, 1977; Sturgess & Clatworthy, 1981).

Once divers with physical impairments have been medically cleared to participate, they are placed into one of three categories: 1) Level A: diver is able to provide equal assistance to dive buddy, so there are no restrictions to who may be their buddy; 2) Level B: diver is able to provide emergency care for self, but unable to provide equal assistance to dive buddy, so they must dive with two certified divers; 3) Level C: able to use dive gear safely, but cannot help oneself during an emergency, so they must dive with two certified buddies, one of whom is required to be a certified Rescue Diver (Greenhalgh & Brousseau, 2005; Madorsky, 1988). Beyond additional trained buddy supports, divers with physical impairments may use adaptive equipment in conjunction or in lieu of traditional dive gear. Most commonly, people with lower limb impairments will use webbed gloves or propulsion devices when fins are not a realistic or helpful option. Furthermore, for people who are unable or unwilling to use traditional regulators, full-face masks supply not only the necessary blended air, but can provide two-way communication devices to buddy divers or the support team on the surface. While several commercial adaptive equipment suppliers exist, it is not uncommon for divers with physical impairments to modify their equipment themselves.

Adaptive scuba diving is being heralded as a successful, albeit nontraditional response to common barriers found in other programs involving physical activity for people with physical impairments (Almeida, Bell, & Sander, 2007; Carin-Levy & Jones, 2007; Cheng & Diamond,

2005; Gracyk, 2010; Madorsky, 1988). Most commonly, research stresses the importance of navigating space 3-dimensionally while remaining weightless, permitting "one to leave wheelchairs, crutches, and false limbs behind on the bank and to allow oneself to forget about stairs and curbs" (Gracyk, 2010, p. 18). While these articles argue and hypothesize that psychosocial and medical benefits exist, few attempt to detail or quantify them. Instead, the majority parallel traditional scuba literature by solely identifying or refuting any potential health risks (Beauprie, 1989; Breskovic, et. al., 2008; Cheng & Diamond, 2005; Gracyk, 2010; Novak & Ladurner, 1999; Sykes, 1994). The remaining articles either describe how to train adaptive divers safely (Greenhalgh & Brousseau, 2005; Fleming & Melamed, 1977; Madorsky, 1988; Sturgess & Clatworthy, 1981) or provide first-person or anecdotal experiences with adaptive scuba diving (Axelson, 1996; Kors, 2009; Robinson, 1984; Tainsky, 1999).

Approaching the topic from a clinical perspective, however, Carin-Levy and Jones (2007) investigated not only the motivations behind participating in adaptive scuba diving, but the subsequent benefits that those participants experienced as well. Three male adult divers with physical impairments (two with spinal cord injuries requiring the use of a wheelchair and one with a single below-knee amputation) were recruited from a local dive club and interviewed over the phone. Data analysis revealed four emergent themes: 1) feelings of freedom from impairment, 2) enhancement of social experiences, 3) enhancement of self-concept, and 4) expressions of optimal experience (getting lost in the moment) (Carin-Levy & Jones, 2007). While there are several limitations to this study (small sample size, low sample diversity, and single method for data collection), it serves as the first attempt to capture the benefits of adaptive scuba diving that so many authors have only hypothesized. These promising results highlight the need for more intensive and robust studies on adaptive scuba.

2. Theoretical Background

Environmental Press Theory and its parent theory, the Ecological Model of Aging (EMA), are routinely cited as a means to describe and interpret the interactionist relationship between a person and his or her surrounding environment. Lawton's Ecological Model of Aging (1973) is an expanded version of Lewin's (1951) model in which behavior (B) is a function (f) of person (P) and environment (E), or $B = f(P , E)$. Lawton's EMA includes an important relationship that Lewin's model failed to include: the interaction between the person and their environment. With this theoretical advancement, $B = f(P , E)$ becomes $B = f(P , E , P \times E)$ (Lawton & Nehamow, 1973). Adding this new variable, three realms must now be investigated and measured when researching setting-specific behavior: the person, the environment, and the reciprocal transaction between the person and the environment.

When examining person-environment fit, the imagery of a seesaw can be helpful. As someone's functional capacities *decline* (personal competency), the intolerance of physical barriers or difficulties *increases* (environmental press). Conversely, as an environment includes *more* prosthetic interventions, the *less* stress (or environmental press) the user feels within the space (Morgan et. al., 1984; Moore et. al., 2003). Although the relationship between the person and the environment oscillates (or seesaws) as one variable changes, there is an optimal balance that, if achieved, promotes psychological wellbeing and behavioral or task-related proficiency (Lawton & Nahemow, 1973). Lawton and Nahemow (1973) inferred with their Competence-Environmental Press Model (C-EPM), that if a person's abilities match their environment, then they would experience positive affect and adaptive behavior. If there is an incompatibility, however, then a person may exhibit negative affect or maladaptive behavior. Figure 2.1 visually displays the expected results from the Competence-Environmental Press Model, which creates a fanning pattern from dysfunction to optimized wellbeing to dysfunction again (Lawton & Nehamow, 1973, p. 317).

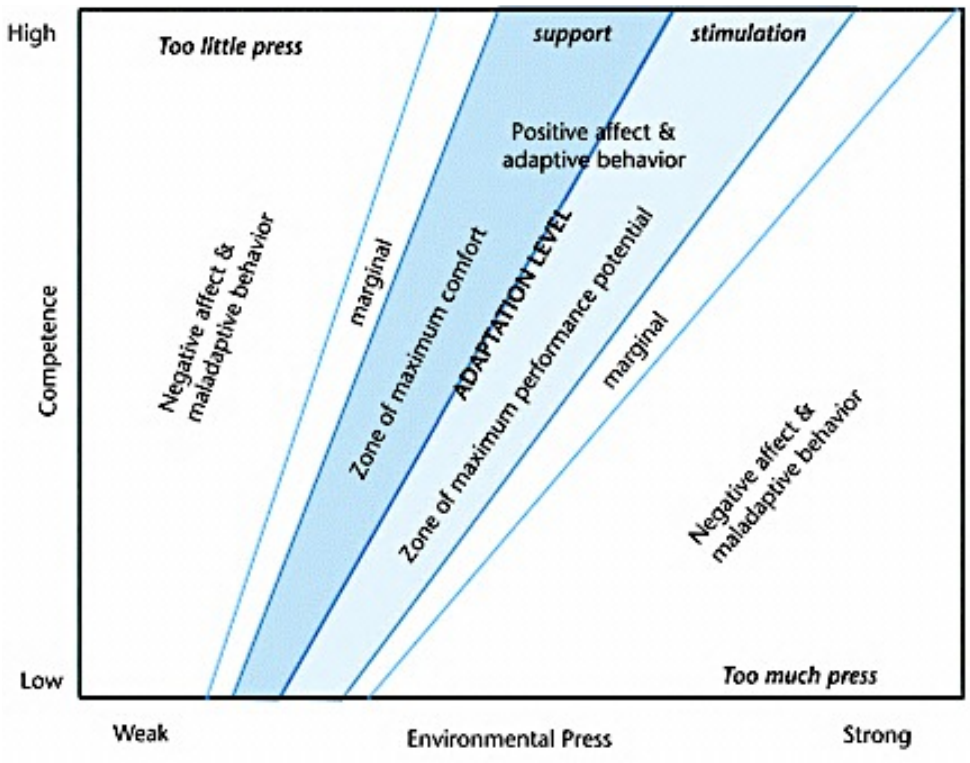


Figure 2.1: The Competence-Environmental Press Model (Lawton & Nehamow, 1973, p. 317)

Within the desired realm of positive affect and adaptive behavior, there are two zones: 1) the Zone of Maximum Comfort (highlighted in dark blue in Figure 2.1), and 2) the Zone of Maximum Performance Potential (highlighted in light blue in Figure 2.1). While both provide beneficial outcomes, there are important distinctions. With more press, individuals may experience initial frustrations by the added stimulation, but will eventually replace them with feelings of great satisfaction and pride once the task is completed. With less press, however, individuals will likely feel relaxed as they are supported and comforted throughout the experience, but will never be challenged to increase their competencies (Lawton & Nehamow, 1973). It is important to be mindful that regardless of whichever zone an activity falls within, the span of positive affect and adaptive behavior widens as individual competencies increase. That is, the tolerance of environmental press variability is greater for individuals with higher competencies.

The theoretical models of disability have coopted the concept of environmental press to redefine disability as the incompatibility of a person and their environment, meaning that "disability is not inherently a part of the person, but rather a function of the interaction between the person and the environment. That is, disability is a dependent variable and results from a gap between the capabilities of the individual and the demands of the environment, both independent variables" (Putnam, 2002, p. 802). According to the layperson, a person who uses a wheelchair has a "disability" regardless of the situation or features of a space. From the disability perspective, however, that person would not have a disability until they are in an environment that offers stairs as the only means to maneuver between floors or is denied a job due to discriminatory practices. Michelle Putnam (2002) reasons that:

> "…the true issue here is much more than semantics. From the theoretical standpoint of social models of disability, a person does not *have* a disability, a person *experiences* a disability. This distinction has the net effect of removing from the person the exclusive burden of accommodating him- or herself to the environment that contributes to disability by sharing the responsibility with the environment to create a more balanced situation. In social models of disability, both the person and the environment have adaptive capabilities" (p. 804).

If disability (D) is a function (f) of an incompatible or negative transaction between a person (P) and an environment (E), then Lawton's EMA could be expanded to include two new equations: $D = f[-(P \times E)]$ and being abled (A), or enabled, would be represented as $A = f[+(P \times E)]$. Using the disability approach, the introduction of a personal or environmental intervention could eliminate the disability even though the physical impairments would remain. Conversely, it is possible for a person with no physical impairments to be disabled by a particular situation (Freund, 2001). The social models of disability, while acknowledging that there is a pathway

from physical impairments to disablement, also stress that disability can occur when no such link is present.

Employing the social models of disability, Verbrugge and Jette (1994) established a theoretical framework that illustrates how disabilities are formed. In The Disablement Process, disability (or disablement) is not a permanent status, but rather the result of a multitude of factors that combine over time to create a disabling situation. According to their Disabling-Enabling Process Model (D-EPM), the pathway to disablement is a linear process, which includes pathology (confirmed medical conditions), impairments (physical incapacities), functional limitations (inability to perform a task in a specific setting), and disability (the disabling place or situation) (Putnam, 2002). Verbrugge and Jette (1994) stress that one should "think of the main pathway as a set of probabilities, or effects, that occur if a chronic condition operates in a social vacuum, with only medical factors operating" (p. 8). In reality, however, even if two people share the same pathologies, their impairments or functional limitations would be expressed differently due to the unique psychosocial and cultural contexts surrounding their medical realities.

These sociocultural contexts are manifested externally to the pathway through extra-individual factors (environmental demands) and intra-personal factors (personal capacities) (Verbrugge & Jette, 1994). According to this model, since disability occurs only when there is a mismatch between a person's capacities and the environments demands, disablement can be avoided or mitigated through targeted interventions. Interventions can be introduced within the environment (home modifications, home health care aides, etc.) or upon the person (mobility device, occupational therapy, assistive technology, etc.). Risk factors, both environmental and individual, are also included as peripheral factors that can hasten or influence the pathway towards disability. Whenever risk factors are controlled or interventions are implemented, however, a person who once experienced disability may return to an earlier stage within the pathway. A diagram expressing the Disabling-Enabling Process Model is offered as Figure 2.2.

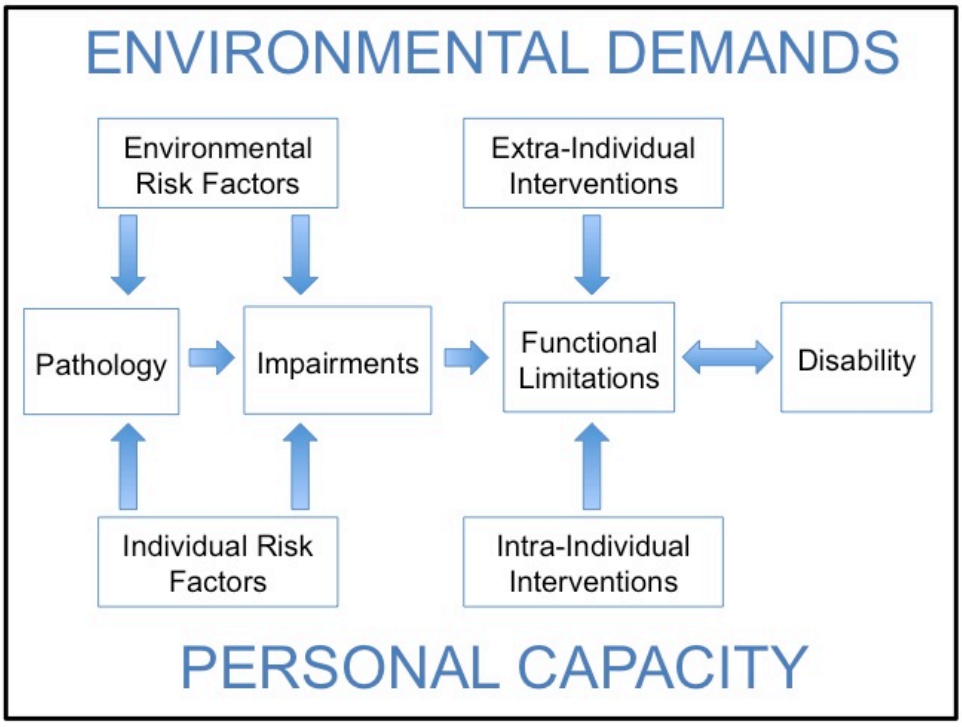


Figure 2.2: The Disabling-Enabling Process Model (Verbrugge & Jette, 1994)

By offering an embedded understanding of how one experiences disability, the D-EPM also reveals an important distinction between intrinsic and actual abilities. Intrinsic disabilities are measured by the "difficulty doing Activity X without personal or equipment assistance," while actual disabilities are defined when those aids are utilized (Verbrugge & Jette, 1994, p. 8). That is, *intrinsic disabilities* are those experienced during the main pathway of the disablement process, while *actual disabilities* are detailed when the entire Disabling-Enabling Process Model is considered. The inherent difference between the two emphasizes the increase in ability that people can experience when aided by their routinely used supports. The World Health Organization (WHO) expanded this concept further in its International Classification of Functioning, Disability and Health (ICF) model. What Verbrugge and Jette (1994) call "actual disability" is termed "performance" under this framework (Masala & Petretto, 2008). While these constructs detail what an individual is currently able to accomplish within a given

environment, *capacity* "aims to indicate the highest probable level of functioning that a person may reach in a given domain at a given moment" (Masala & Petretto, 2008, p. 1241). Using capacity to illustrate someone's ultimate potential, any gap that exists between it and their performance would highlight an opportunity for more enabling interventions. If the gap between the two remains, however, then there is a fundamental mismatch between an individual and their environment, and the situation could be perceived as disabling to the person.

Although the D-EPM emphasizes the influence of an individual's unique context upon the trajectory of their own wellbeing through exposing the numerous risks as well as opportunities to prevent or limit a disabling situation, it fails to represent the potential harm from the addition of too much support. The model assumes that as long as disability is avoided, it is a healthful outcome, which the Ecological Model of Aging directly contradicts. EMA, and its Competence-Environmental Press Model, maintain that unbalanced support, either from too much or too little, is detrimental to an individual's health and wellbeing. The C-EPM is not without its own weaknesses and shortcomings, however. By limiting the scope of possible interactions to individual competence and environmental press, the model neglects to acknowledge the external influences outside of the immediate environment. If one were to integrate the Competence-Environmental Press Model within the Disabling-Enabling Process Model, the external debilitating pressures of a person's environment would be detailed and quantified, while interventions could be considered enabling or disabling. Within this combined perspective, environmental and individual risk factors and/or the overabundance of extra- and intra-individual interventions would push individuals towards negative affect and maladaptive behavior (presence of disability), while eliminating or reducing environmental and individual risk factors and/or the implementation of appropriately catered interventions would push individuals towards positive affect and adaptive behavior (absence of disability).

While C-EPM and D-EPM should theoretically be applicable to any setting, they have only been empirically researched within residential environments predominantly. Extending the

concept of person-environment fit to leisure settings, Tsaur, Liang, and Lin (2012) developed the Recreationist-Environment Fit Model (R-EFM). When applied within this domain, person-environment fit is expanded to include three separate, yet corresponding components that combine to describe one's overall match with a recreational environment: 1) supplementary fit, 2) requirements-abilities fit, and 3) needs-supplies fit. Within this framework, ideal supplementary fit occurs when the values of the recreationist match the values of the professional outfitter providing the activity. These refer to the fundamental belief and attitude systems that shape policies and drive expected behaviors. The requirements-abilities fit details the relationship between a recreationist's abilities and the environment's requirements or demands of them. These manifest through the four subcomponents of knowledge, skills, experience, and equipment. Finally, the needs-supplies fit is satisfied when the desire for natural resources, facilities, environmental functions, and interpersonal opportunities are supplied by the recreational environment. A diagram expressing the Recreationist-Environment Fit Model is offered as Figure 2.3.

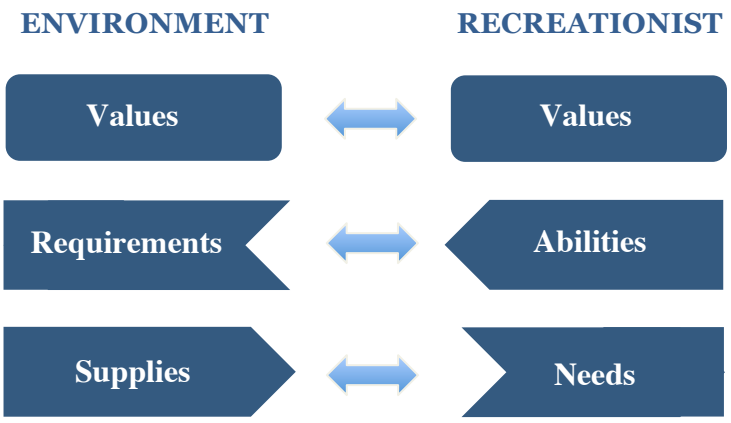


Figure 2.3: Recreationist-Environment Fit Model (Tsaur, Liang, & Lin, 2012)

When the supplementary, requirements-abilities, and needs-supplies fits are met, Tsaur, Liang, and Lin (2012) posit that the recreationist will experience increased self-efficacy, recreational satisfaction, destination loyalty as well as experience flow, which is a phenomenon where a person "becomes so engrossed in the activity that nothing else seems to matter, as the person's attention is entirely devoted to the engagement in the activity. Other features are the abandonment of self-awareness and self-consciousness, and a distorted sense of time" (Carin-Levy & Jones, 2007, p. 7). Since this model has not yet been applied to recreationists with physical impairments, the processes as well as the outcomes may vary or need adjustment when applied to a nontraditional research sample.

While the R-EFM exposes the importance of an individual's values system, it fails to address the role that personality may play in recreationist-environment fit. Similarly, both C-EPM and D-EPM do not acknowledge this potential variable as well. Even though all three theories emphasize the importance of reducing an experience to the individual level, none suggest how to evaluate or define the person in these transactional relationships between him- or herself and an environment. For adventure sports like scuba diving, it has been shown that participants who engage in these types of activities have higher levels of extraversion and openness to new experiences, but lower levels of neuroticism and conscientiousness (Tok, 2011). While Tok's research (2011) sought to describe the between-group differences of participants and nonparticipants of risky sports, the results could have been used to explain any within-groups differences in participants' experiences as well. For example, adventure sport participants are lower in conscientiousness on the aggregate, but those individuals with the lowest levels might be at the highest risk for injury or death (Tok, 2011).

3. Present Study

This study investigated the psychosocial benefits that scuba diving may provide people with physical impairments by completing a multi-case study of adaptive divers in two settings (pool and open ocean). Expanding upon previous research by Carin-Levy and Jones (2007) as well as drawing from the Competence-Environmental Press Model (Lawton & Nahemow, 1973), Disabling-Enabling Process Model (Verbrugge & Jette, 1994) and Recreationist-Environment Fit Model (Tsaur, Liang, & Lin, 2012), this study seeks to understand not only the psychosocial benefits of scuba diving, but the mechanism(s) behind them (Aim #1), while discovering whether there are carry over effects to common barriers experienced in daily life (Aim #2).

Aim #1a: *Identify the psychosocial benefits of scuba diving for people with physical impairments.* ***Aim #1b:*** *Specifically, how do challenge, external supports, and setting contribute to those benefits?*

Most research regarding scuba diving describes the risk, namely medical consequences and contraindications of participating in the sport (Beauprie, 1989; Breskovic, et. al., 2008; Cheng & Diamond, 2005; Gracyk, 2010; Novak & Ladurner, 1999; Sykes, 1994). Due to this narrow focus, there is a substantial gap in research regarding the actual and demonstrable benefits of scuba diving, regardless of the presence or absence of functional limitations. Research on this topic should strive to do more than simply evaluate risk so that each diver can make an informed decision regarding their participation. For example, anecdotal evidence suggests that scuba diving may be as successful a therapy for persons with physical limitations as traditional water therapy; however, few studies have focused on this, making parallels between studies hard to draw and definitive outcomes difficult to support or verify.

While increasing physical activity has long been the focus and recommendation of disability-related research (Blinde & Taub, 1999; Lundberg, et. al., 2011; Motl, et. al., 2009; Mulligan, 2011; Rimmer, et.al., 2004; and Wilhite & Shank, 2009), without understanding the

processes behind the positive outcomes associated with scuba diving or similar adaptive sports, directed interventions and their necessary supports cannot be planned or implemented properly. Therefore, it is critical to understand not only what is naturally occurring, but how best to manipulate the activity to promote and safeguard these benefits.

Based on these themes, the following research hypotheses were created and tested:

Hypothesis 1.1: When participants report a match between the environmental demands and their competencies (i.e. the challenge experienced falls within C-EPM's Zones of Maximum Comfort or Maximum Performance Potential), they will experience positive emotional responses and psychosocial benefits. If the dives offer too little or too much press, however, then participants will exhibit negative affect and maladaptive behaviors.

Hypothesis 1.1a: When participants report a match between the environmental demands and their competencies (i.e. the challenge experienced falls within C-EPM's Zones of Maximum Comfort or Maximum Performance Potential), they will experience increased feelings of confidence. If the dives offer too little or too much press, however, then participants will note a decrease in feelings of confidence and self-efficacy.

Hypothesis 1.2: When a person reports a match between the adaptive equipment needed and supports received (i.e. the extra-individual supports as highlighted within D-EPM and R-EFM), they will experience positive emotional responses and increased feelings of confidence and self-efficacy.

Hypothesis 1.3: When a person reports a match between the peer supports needed and the supports received (i.e. the extra-individual supports as highlighted within D-EPM and R-EFM), they will experience an increase in confidence and express fewer perceived differences between themselves and their able-bodied peers.

Hypothesis 1.4: As the open ocean setting is more engaging, challenging, and interactive, the psychosocial benefits will be more pronounced among its participants than those who dive in a pool.

Aim #2: *Investigate whether conquering challenge within an unconventional environment (scuba diving) affects how people with physical disabilities perceive and experience common barriers during their daily lives.*

While most adaptive sports require participants to maintain their mobility aids, scuba diving permits "one to leave wheelchairs, crutches, and false limbs behind on the bank and to allow oneself to forget about stairs and curbs" (Gracyk, 2010, p. 18). Due to this change in perspective, it is possible that adaptive divers might reevaluate their relationships with the physical barriers in their lives, and modify their adaptive responses. Because of this, the following research hypothesis was created and tested:

> Hypothesis 2.1: After scuba diving, participants will express an increase in knowledge, skills, and/or adaptive behaviors that they feel are necessary to combat common barriers in their lives.

4. Methodology

Design

A multi-case study approach was used in order to conduct a preliminary investigation into the effects that scuba diving may have on persons with physical impairments. This study was comprised of two separate case studies: one case study contained two cases (n = 2) from a weeklong open ocean dive trip to Cozumel, Mexico in December 2013 (aka Open Ocean Case Study), and the other case study contained one case (n = 1) from a single pool session in a suburb of Chicago, Illinois in April 2014 (aka Pool Case Study). Data collection was completed by the principal investigator only and IRB exemption was granted by the Institutional Review Board at Cornell University on December 3, 2013.

Participants

Open Ocean Case Study

There were two (n = 2) participants in this study. Participant A was male, white non-Hispanic, 44, and acquired his spinal cord injury 41 years prior (age 3), leaving him paraplegic and requiring the use of hand crutches or on rare occasions, a manual wheelchair. Participant B was female, white non-Hispanic, 52, and acquired her spinal cord injury 33.5 years prior (age 18.5), leaving her quadriplegic and requiring the use of a power wheelchair. Both had been certified to scuba dive as a Level C adaptive diver (must have two dive buddies with them at all times, one of whom must be a certified Dive Master), and logged over 50 dives each before the dive trip to Cozumel in the winter of 2013.

Pool Case Study

There was one (n = 1) participant in this study. Participant C was female, white non-Hispanic, 39, and has Spina Bifida, which requires the use of a wheelchair. She is a Level C

certified diver with 6 logged open ocean dives, 10 logged quarry dives and over 50 logged pool dives.

Five-Factor Model of Personality

Personality traits from the five-factor model of personality (openness, conscientiousness, extraversion, agreeableness, and neuroticism) were collected through the Revised NEO Personality Inventory questionnaire (NEO-FFI) in order to compare the sample population to the general population, thereby defining and characterizing any self-selection bias present in this study. Additionally, these results were used to offer possible explanations for any differences of the various participants' experiences during the study.

Compared with most men, Participant A is in the 86th percentile for openness, 58th percentile for conscientiousness, 70th percentile for extraversion, 19th percentile for agreeableness, and 57th percentile for neuroticism. Compared with most women, Participant B is in 83rd percentile for openness, 72nd percentile for conscientiousness, 66th percentile for extraversion, 93rd percentile for agreeableness, and 55th percentile for neuroticism. For Participant C, she was in the 46th percentile for openness, 9th percentile for conscientiousness, 60th percentile for extraversion, 65th percentile for agreeableness, and 71st percentile for neuroticism.

Setting

Open Ocean Case Study

There were two rounds of data collection for this study. The first round of data (consent forms, personality questionnaires, dive logs, and debriefings) was collected at Hotel Cozumel and Resort in Cozumel, Mexico. The second round of data (final interviews) was collected via phone while the participants were in their individual homes 4-6 weeks after the trip ended.

Cozumel is a 250 square mile island six miles off the eastern coast of the Yucatan Peninsula in Mexico. Popular for its diving and snorkeling opportunities, Cozumel's primary industry is tourism. In December, air temperatures average mid- to high-80s with water temperatures in the low-80s, requiring only a 3mm-5mm wetsuit for most divers. Due to strong currents, however, nearly all dives in Cozumel are drift dives, meaning that divers have to exert little effort to travel long distances underwater, but may not be able to control precisely where they travel without struggling heavily against the tide.

Hotel Cozumel and Resort has a longstanding relationship with Diveheart, one that is publicized on their website. The hotel offers ten rooms designed for guests with diverse mobility impairments, and their on-site dive operator, Dive Paradise, has completed all adaptive scuba trainings, resulting in every staff member being a certified adaptive dive buddy to divers with cognitive and/or functional impairments. During this trip, Dive Paradise set the daily itinerary and selected dive site locations according to the available weather and ocean current reports.

Pool Case Study

Just like the Open Ocean Case Study, there were two rounds of data collection for this study. The first round of data (consent form, personality questionnaire, dive log, and debriefing) was collected at Oaklawn Community High School in Oaklawn, Illinois, a suburb 16 miles south of Chicago. The second round of data (final interview) was collected via phone while the participant was at work three weeks afterwards.

Oaklawn Community High School has a single pool that is 25 yards long and six lanes wide. On one side, the pool is 3 feet deep, eventually sloping down to 14 feet on the other. The pool is heated, and most divers require only a 3mm-5mm wetsuit.

Diveheart has an ongoing rental agreement with the pool for the 8:30am – 2:30pm timeslot for one Sunday out of every month. While the organization occupies the space for six

hours, adaptive divers and their buddies are only in the pool for an hour, with the remaining time being devoted to set-up, planning, and cleanup.

Constructs & Measures

Open Ocean & Pool Case Studies

Scuba diving's influence on the wellbeing of persons with physical impairments was captured through an augmented dive log as well as semi-structured interviews (trip debriefing and final interview). These methods are described in detail below.

Augmented Dive Logs: When scuba diving, traditional dive logs are used to document universal objective characteristics such as visibility, greatest depth, equipment used, and total time spent underwater. In this study, however, dive logs were augmented to include subjective scales to capture any changes in confidence, emotions, perceptions of challenge level, as well as mood and health. Furthermore, the dive log measured a participant's goal setting and goal attainment behavior in order to detail feelings of self-efficacy or whether any barriers were experienced. Below, Figure 4.1 provides an example of this dive log.

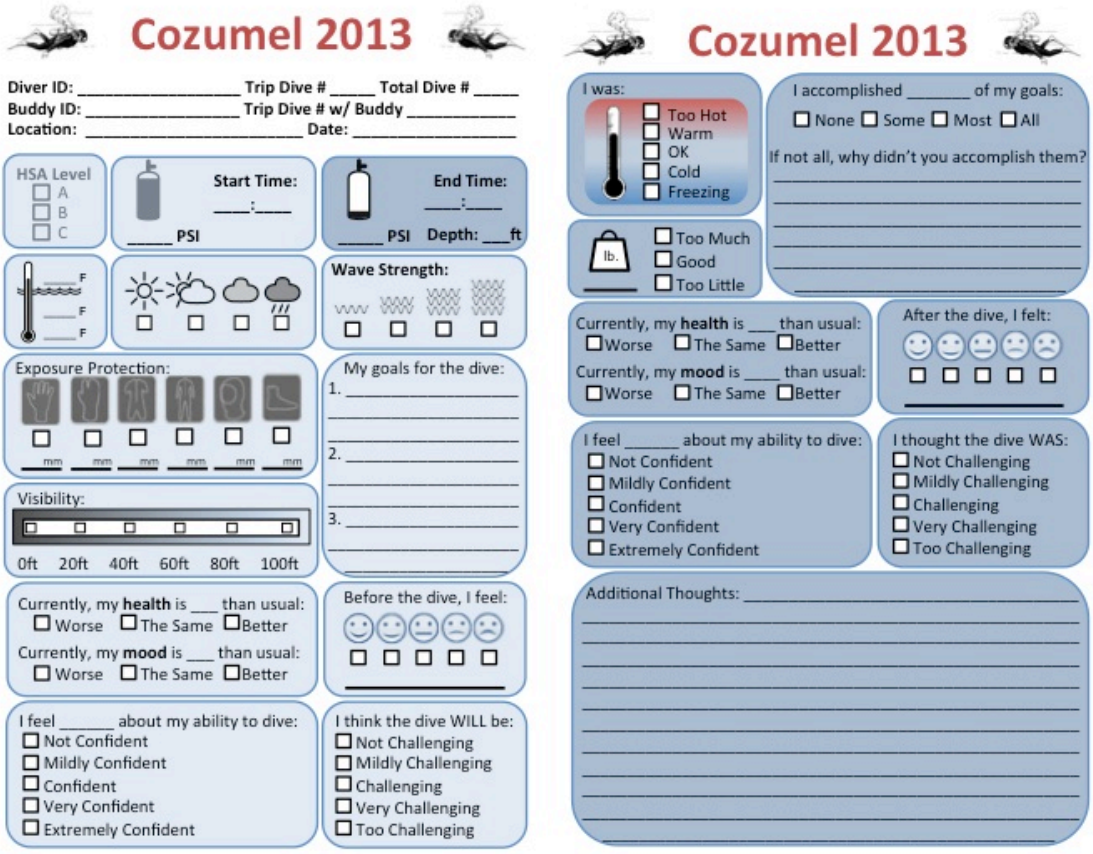


Figure 4.1: Sample Augmented Dive Log

Semi-Structured Interviews: At the completion of the scuba diving trip, a retrospective evaluation (trip debriefing) was used to summarize the totality of the experience, offering open-ended questions to prompt the participant to reflect upon the trip. These questions and their corresponding study aims are offered below:

Question	Study Aim
1. What motivated you to scuba dive?	Aim #1
2. How did the experience of scuba diving compare to your expectations?	Aim #1
3. What did you like BEST about scuba diving?	Aim #1
4. What did you like LEAST about scuba diving?	Aim #1
5. What was the most surprising part about scuba diving?	Aim #1
6. Would you like to scuba again? Why or why not?	Aim #1

7. What was one of the more challenging aspects of scuba diving? 7a. How did you handle this challenge?	Aim #1
8. What did you learn through scuba diving? 8a. How can you apply what you just learned to other challenges you face?	Aim #1 & Aim #2
9. What changes, if any, have you experienced in knowledge, skills, attitudes, or feelings as a direct result of scuba diving?	Aim #1 & Aim #2
10. What advice would you give someone with a physical disability who was considering scuba diving?	Aim #1
11. What do you do to stay active? 11a. How does this compare to scuba diving?	Aim #1
12. Is there anything you'd like to mention that I haven't asked?	Future Aims

Several weeks later, participants were again asked to reflect upon their experiences with scuba diving and whether it had resulted in a reassessment of their relationships with their able-bodied peers, their bodies, their functional limitations, or the common barriers they experience throughout their daily lives. Since some of the questions inquired about specific spaces or attributes of spaces, some of the questions had to be modified depending on whether the participant had scuba dived in the pool or the open ocean. A table detailing the questions, in which case study they were asked, and their corresponding study aims, is offered below:

Case Study	**Question**	**Study Aim**
Open Ocean & Pool	1. Have you gone scuba diving since we last spoke?	N/A
Open Ocean & Pool	2. Do you plan to dive again? When? With Diveheart? 2a. Why or why not? (i.e. what benefits, if any, does scuba diving provide for you?)	Aim #1
Open Ocean	3. How would you feel about diving in a: pool? aquarium?	Aim #1
Pool	3. How would you feel about diving in an: aquarium? ocean?	Aim #1
Open Ocean & Pool	4. How would the experience change for you depending on the environment?	Aim #1
Open Ocean & Pool	5. What do you remember MOST about the scuba experience?	Aim #1
Open Ocean & Pool	6. What did you like BEST about it?	Aim #1

Open Ocean & Pool	7. What was the most challenging aspect of it?	Aim #1
Open Ocean & Pool	8. Think of a barrier you face in your daily life (at home or at work). Please describe it for me. 8a. How do you normally overcome this challenge?	Aim #2
Open Ocean & Pool	9. What, if anything, will you do differently when facing this challenge because of the experiences you had while scuba diving? 9a. Is this something you do now?	Aim #2
Open Ocean & Pool	10. When you're visiting a new space or completing a new task, how do you prepare?	Aim #2
Open Ocean & Pool	11. What do you worry most about exploring a new space?	Aim #2
Open Ocean & Pool	12. What attributes of a space let you know that it will be either supportive or problematic for you?	Aim #2
Open Ocean	13. I'd like to remind you of the dive maps we used while determining the challenge level of each dive. Was it useful to see the dive prior to experiencing it? 13a. Would that be helpful for you in your daily life? To envision things in 3-dimensions?	Aim #2
Pool	13. Would it be helpful to envision spaces 3-dimensionally before experiencing them for the first time?	Aim #2
Open Ocean & Pool	14. Is there anything that diving has done that has made you think about space differently?	Aim #2
Open Ocean & Pool	15. Does scuba diving make you think about your body differently? 15a. Do you have a different relationship with it underwater?	Aim #1
Open Ocean & Pool	16. Are there any additional thoughts that you'd like to mention?	Future Aims

Procedure

Open Ocean & Pool Case Studies

Participants were recruited through existing scuba diving events planned by the professional adaptive scuba diving outfitter Diveheart. Once the excursions had reached capacity, the PI invited event goers to join the study, while emphasizing that their decision to not participate would have no negative impact on their experience or enjoyment of it. The consent form was emailed or read aloud (depending on preferred form of contact) during the initial request. Once the participant agreed to be involved with the study, the informed consent

form was presented in person for final review and execution of their signature prior to the first dive. After consent was obtained, participants were then asked to complete a short personality questionnaire (NEO-FFI). The questionnaire took 20 – 40 minutes to finish, and was collected before the first dive as well.

For the Open Ocean Case Study, there were eleven (11) dives during the trip (two per day with one bonus night dive on the fourth day of diving). Each participant participated in every dive. With each dive, the participants were required to complete the augmented dive log offered in Figure 4.1. The light blue boxes of the dive log were completed just prior to each dive, while the dark blue boxes were completed immediately afterwards. Excluding the environmental factors (temperature, visibility, wave strength, etc.) which were only collected once per dive, all other components were designed as a pre- and post-test so that a comparison between a participant's expectations and their subsequent experience could be made. In order to provide enough information for the participant to adequately calibrate their expectations, the Dive Master announced the dive site as well as detailed the dive plan (i.e. maximum allowable time and depth below surface). Additionally, a drawing of every dive site was provided to the participants to help orient them to the new site. The dive log took five – seven minutes to complete each time. A sample of one of these dive maps is offered in Figure 4.2.

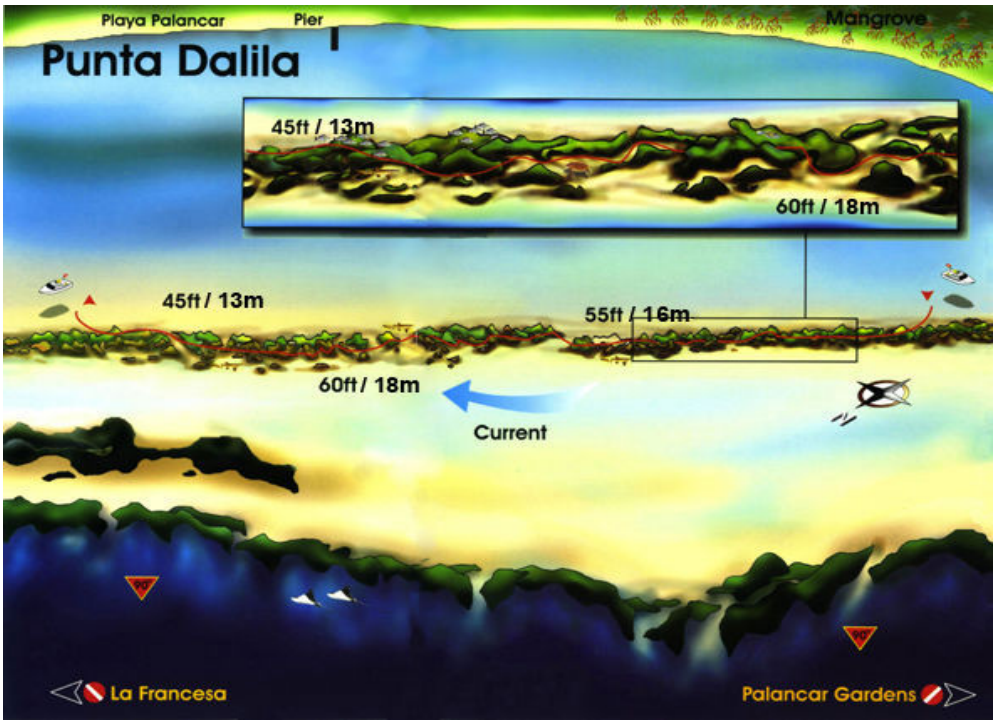


Figure 4.2: Sample Dive Map (http://barcelo-maya-diving-centre.com/images/planos/cozumel/14_PUNTA_DALILA.jpg)

Since the dive experience within the Pool Case Study was on a smaller scale than the Open Ocean Case Study, the procedure could be streamlined. For instance, there was no need to familiarize the diver to the environment since she tries to dive there monthly. Although dive logs are traditionally only used during open water dives, the augmented dive log was appropriate for the pool setting and did not need to be modified.

Once the dive(s) concluded, participants were interviewed for a trip debriefing, which prompted them to evaluate and detail their overall experiences with scuba diving. The debriefing took an average of 60 minutes. Finally, participants were contacted 4 – 6 weeks after the dive trip to interview them about their experience again, and how it has impacted their life. The final interview took an average of 75 minutes to finish. While no audio recordings were made for either interview type, the principal investigator typed the comments verbatim as the participant

spoke. At the conclusion of each interview, the PI read the transcript aloud to the participant to guarantee its veracity.

Data Analysis

Open Ocean & Pool Case Studies

Individual Dive Data Analysis

Using the results from the augmented dive logs, each dive was placed on the Competence-Environmental Press Model (C-EPM) (Figure 1.1). A bright red hollow circle (○) was used to signify their expectations, while a full burgundy circle (●) was used to signify their reported experience. If the change is substantial, then a burgundy line connects the two circles; otherwise, they overlap. Five rules were used to determine where the circles should be placed:

1) Since the span of positive affect and adaptive behavior widens or narrows depending upon an individual's competencies (i.e. the tolerance of environmental press variability) (Lawton & Nehamow, 1973), each participant must be placed appropriately along the competency spectrum. This was determined by the need for external and peer supports in order to dive safely.
2) According to C-EPM, people exhibit stimulation when they are appropriately challenged, supported when they are mildly challenged, and at risk for negative affect and maladaptive behavior whenever they are not challenged appropriately (Lawton & Nehamow, 1973). Using this framework, challenging dives (either in expectation or reality) were placed in the stimulation zone, mildly challenging dives were placed in the support zone, and not challenging dives would either be placed in the marginal zone or negative affect and maladaptive behavior depending on the results related to confidence and emotions as explained in the following rules.
3) If there was a change in confidence before and after the dive, then the circles changed in relationship to each other vertically. That is, if the confidence increased, the

burgundy circle is moved upwards along the same vertical plane. If the confidence decreased, then the opposite pattern happens.

4) If there was a change in emotional response, then the circles changed in relationship to each other horizontally. That is, if the emotions improved, the burgundy circle is moved sideways to the right along the same horizontal plane. If the emotions worsen, then the burgundy circle is moved sideways to the left.
5) Finally, should the expectations and experiences line up perfectly among all measures, then the circles are placed on top of one another.

The placement of the circles and their relationship to one another will be used to determine the overall fit between each participant and their diving experience. This will provide the necessary context for the outcomes expressed in the qualitative data as well as offer sufficient information to either support or contradict the theoretical frameworks discussed in the literature review.

Qualitative Data Analysis

All qualitative data, including comments from the augmented dive logs as well as both interviews, were analyzed for emergent themes. Using Microsoft Word, independent phrases were highlighted using different colors and comment stickers were placed next to them in order to title each theme. Once all themes were identified, they were grouped together according to similar content and eventually placed into the following five categories: Person, Person-Environment, Environment, Person-Person, and Disabling/Enabling Factors. In order for a theme to be included in the analysis, it must have been present in at least two (2) of the three (3) participants.

5. Results

Individual Dive Data Analysis

In order to compute the person-environment fit when scuba diving and provide the necessary context for the outcomes experienced by each adaptive diver, their expectations and subsequent experiences were placed onto a simplified Competence-Environmental Press Model (Lawton & Nehamow, 1973), where only the Zones of Maximum Comfort, Maximum Performance Potential, and Negative Affect and Maladaptive Behaviors are shown. Since person-environment fit is an individual-level analysis, each participant's chart and summary of results are presented independently below.

Participant A:

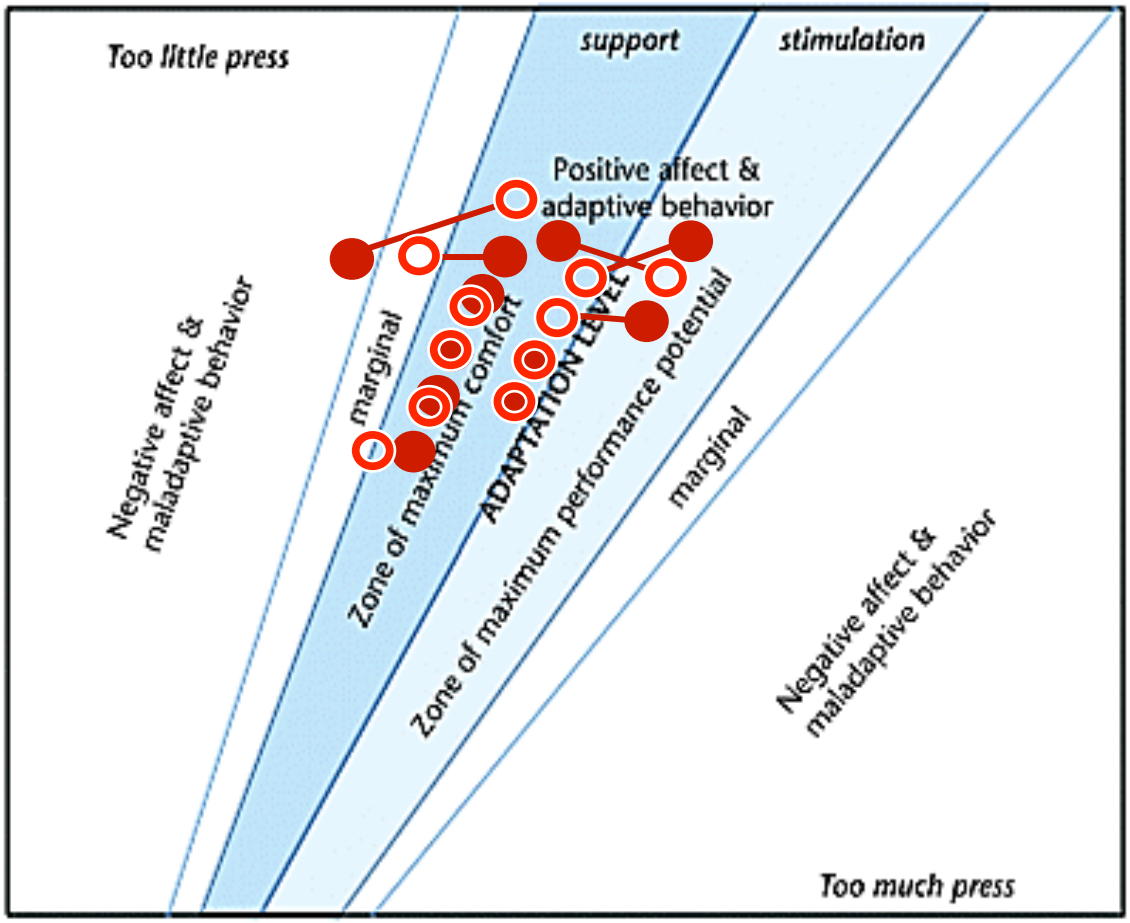


Figure 5.1: Person-Environment Fit (Participant A)

Overall, the expectations for each dive and their realities were relatively divergent. Four dives were more challenging than expected and two were less challenging. Eight out of the eleven dives were within the Zone of Maximum Comfort, two were in the Zone of Maximum Performance Potential, and one was placed in the area of negative affect and maladaptive behavior since the diver expressed significant frustrations after receiving overwhelming and unwanted assistance from his dive buddies.

As shown in the table below, seven out of the eleven dives saw no change in confidence, while three dives resulted in an increase in confidence and only one resulted in a decrease in confidence. Similarly, seven out of the eleven dives saw no change in emotional response, while two dives resulted in an increase and two resulted in a decrease.

	Confidence		**Emotional Response**			
	Before	**After**	**Before**		**After**	
Dive 1	Mildly Confident	Mildly Confident	4	Relaxed	3	Concerned re: weight
Dive 2	Confident	Confident	4	--------	4	Good/Tired
Dive 3	Confident	Mildly Confident	4	Ready	3	Frustrated
Dive 4	Confident	Confident	4	Ready	4	Good
Dive 5	Mildly Confident	Confident	4	Ready	4	Relaxed
Dive 6	Confident	Confident	4	Amused	4	Satisfied
Dive 7	Mildly Confident	Confident	4	Adventurous	4	Chillin’
Dive 8	Mildly Confident	Confident	4	Anxious	4	Relaxed
Dive 9	Confident	Confident	4	Anxious	4	Relaxed
Dive 10	Confident	Confident	3	Go-with-the-flow	4	Relaxed
Dive 11	Confident	Confident	3	A little nervous	5	Excited

Participant B:

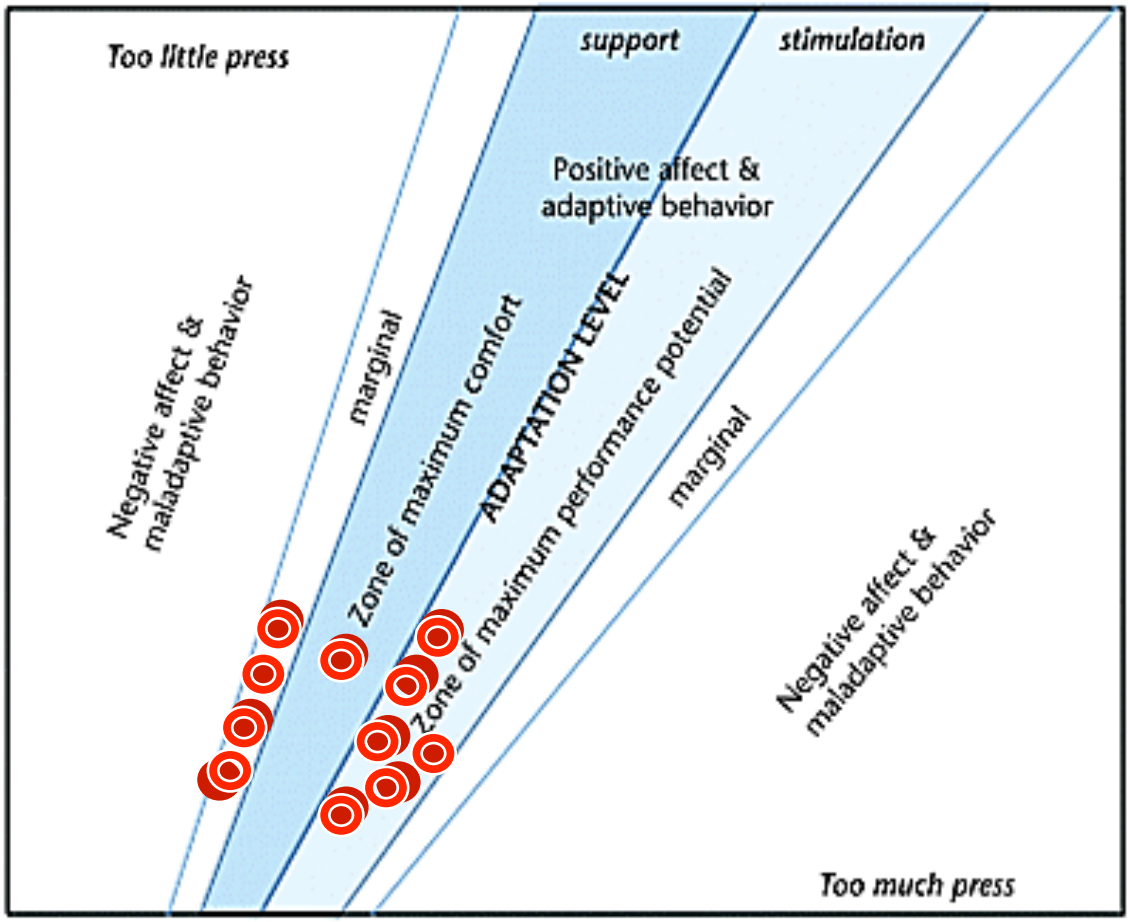


Figure 5.2: Person-Environment Fit (Participant B)

Overall, the expectations and experiences of Participant B matched. Six out of the eleven dives were within the Zone of Maximum Performance Potential, one was the Zone of Maximum Comfort, and four were placed within the marginal area rather than the area for negative affect and maladaptive behavior since the participant expressed positive outcomes for confidence and emotional response despite the dives being labeled as not challenging.

As shown in the table below, seven out of the eleven dives saw no change in confidence, while three dives resulted in an increase in confidence and only one resulted in a decrease in confidence. In regards to emotional response, eight out of the eleven dives saw an increase,

while three saw no change. There were no dives that resulted in a decrease in emotional response.

	Confidence		Emotional Response			
	Before	**After**	**Before**		**After**	
Dive 1	Mildly Confident	Confident	4	Good	4	Pleased
Dive 2	Confident	Mildly Confident	4	--------	4	Happy, but cold
Dive 3	Mildly Confident	Mildly Confident	4	Excited	5	Thrilled
Dive 4	Confident	Confident	4	--------	5	Fantastic
Dive 5	Mildly Confident	Confident	4	Excited	5	Thrilled
Dive 6	Confident	Confident	4	Relaxed & Fulfilled	5	Pleased
Dive 7	Mildly Confident	Confident	4	Excited	5	Very fulfilled
Dive 8	Confident	Confident	5	Excited	5	Satisfied
Dive 9	Mildly Confident	Mildly Confident	4	Thankful	5	Happy
Dive 10	Confident	Confident	4	Excited	5	Pleased
Dive 11	Mildly Confident	Mildly Confident	4	Excited	5	Thrilled

Participant C:

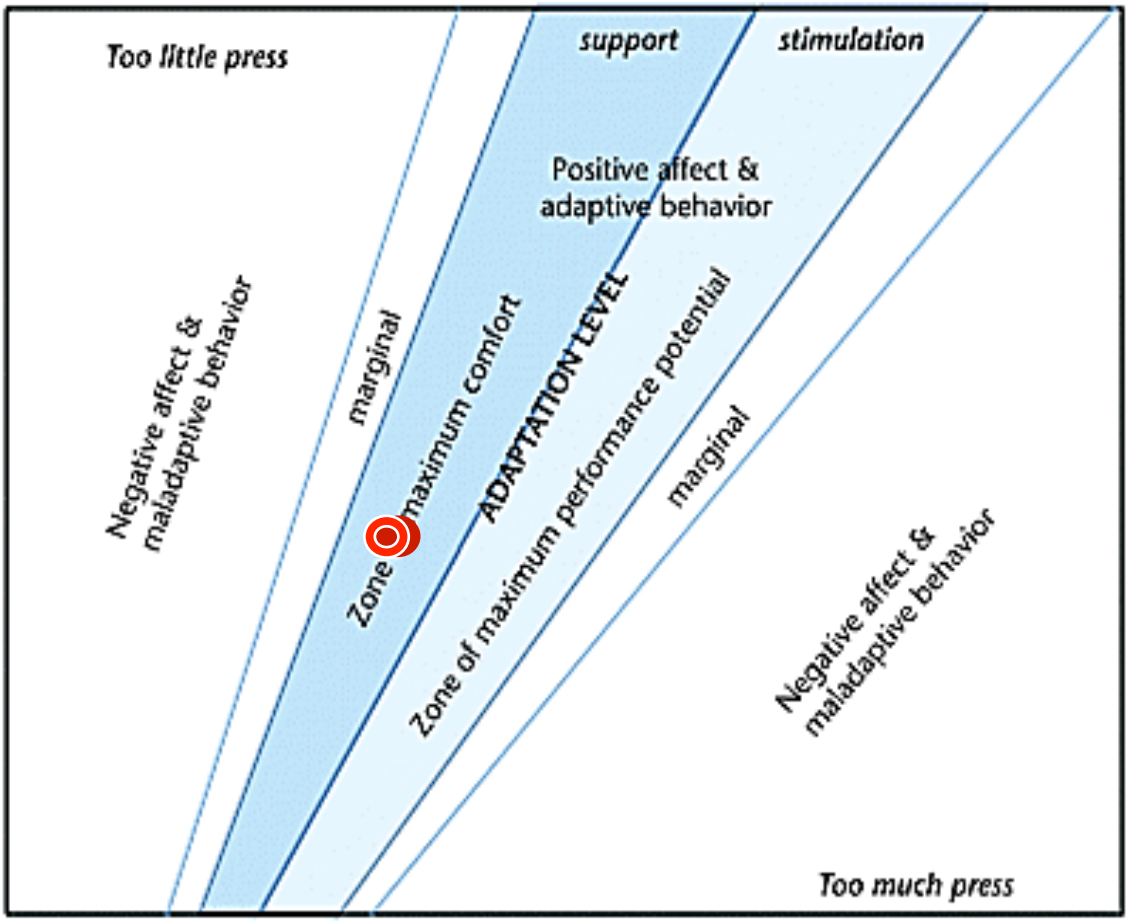


Figure 5.3: Person-Environment Fit (Participant C)

There was only one logged during this event. The expectations and experience matched for confidence and challenge, but the diver did express an increase in emotional response once the dive had completed as shown in the table below.

	Confidence		**Emotional Response**			
	Before	**After**	**Before**		**After**	
Dive 1	Very Confident	Very Confident	4	Happy	5	Happy

Qualitative Data Analysis

The qualitative data provided by the augmented dive logs, trip debriefings, and final interviews were reviewed and analyzed for emergent themes. Once all themes were identified, they were grouped together according to similar topics and eventually placed into the following six categories: Person, Person-Environment, Environment, Person-Person, Disabling/Enabling Factors, and Outcomes. While these categories were developed independent of the Competence-Environmental Press (Lawton & Nahemow, 1973), Disabling-Enabling Process (Verbrugge & Jette, 1994) and Recreationist-Environment Fit Models (Tsaur, Liang, & Lin, 2012), there are overlaps. The commentary within the categories of Person, Person-Environment, Environment, and Outcomes, for example, should draw support from all three theories, while Person-Person and Disabling-Enabling Factors should relate most strongly to the Disabling-Enabling Process (Verbrugge & Jette, 1994) and Recreationist-Environment Fit Models (Tsaur, Liang, & Lin, 2012). Definitions of each category and their corresponding subthemes are offered below.

Person

This category includes how participants described their character, outlook, and desires. There were five themes that emerged within this category: willingness to try new things, desire to constantly improve, desire for adventure, desire to increase permanence of experience, and attitudes towards preparation. These themes are explored and expanded through quotes provided by each participant.

Willingness to try new things:

> Participant A: "It was just something to do. A good use of my time. I was just bored then. A scuba shop every 100 feet. That intrigued me a little. I had been into fishing and boating. I

guess it was just something in my mind that would be worth pursuing, worth exploring – seeing what it was about."

Participant B: "I overcame my apprehension of diving by just being determined to dive. Rather than just say 'I'm not gonna try that' – so just being open to other new experiences. Just do it. Don't let your apprehension hold you back. Of course use your wisdom – don't do something stupid."

Participant C: "A neighbor asked me and it sounds like fun. A lot of it was my husband, though. He really wanted to try it. The neighbor suggested Diveheart. I was a little leery about it, but he encouraged me to go. My husband will pretty much do anything… like he's going skydiving soon, but I would never do that."

While Participant A and B had higher levels of openness to new experiences (86th & 83rd percentile respectively), Participant C was slightly below average at the 46th percentile. This could explain why Participant C expressed a willingness to try certain new things, but needed a little encouragement.

Desire to Constantly Improve:

Participant A: "I never stop training – I'm always trying to improve." When asked if he'd be willing to dive in a pool, he said, "I might consider it if I could stay down and literally not move for 25 minutes and work on my camera skills. That would be one advantage – test photographing it. Gain skills. If I don't see anything new, different or a change, it's not that appealing."

Participant B: During the dives, she said, "I'd like to increase my buoyancy control. I tried new hand techniques for ascending/descending… I used my arms less, so I'm able to get closer to things." Eventually, she hopes to "feel comfortable enough to concentrate on something more than just myself. I can add even more to the experience for others." When

asked if she'd be willing to dive in a pool, she said, "the pool would be good to be in the water & be gravity-free. If it were really deep or there was something that would be in there as a goal – like a swimthrough. The pool is good for practicing buoyancy, skills. But it would be not be interesting – better for keeping skills fresh."

Participant C: When responding to what she likes best about her experiences with diving in a pool, she said, "just the idea of the training – that I can get all that done. Then I can get into the ocean and feel a lot more comfortable with my skill level."

Desire for Adventure:

Participant A: "Prior to scuba diving, I thought I had done a lot – flying, NYC, skiing. Then comes scuba, there's all this new stuff to see. It's just so awe-inspiring to see what's down there…. And the sunken history. It enhances an appreciation of nature and what's left to be explored."

Participant B: "It's something new – always learning, always experiencing something new… I prefer the ocean – it's more adventuresome." Later she adds, "… the ocean would be more challenging & adventuresome. It would be more interesting."

Desire to Increase Permanence of Experience:

Participant A: "It's another world. Looking around, seeing all this other stuff. Like Jacques Cousteau. Take one heck of a great picture. Bring it back… Photos are a way to relive the trip."

Participant B: "Oh yeah, I think about it. I think about it all the time. I think about when it'll start warming up and I can start diving again. The stained glass piece I have in my bathroom reminds me of how beautiful it is (she made it). I look at that every day."

Attitudes towards Preparation

> Participant A: "It's really sink or swim. I'll jump in my car and I will go and drive around and around and around and they say parking is $27 an hour and I will leave, and then drive around and around and around – and not know where to go because there is no map. Or if there is a map, I will walk halfway across the whole thing to find the thing that was next door to begin with. I don't really prepare. I feel like I should just go. Maybe it's laziness. That lack of preparation will cost me though – like I'll pay more for parking. There is a cost with that."
>
> Participant B: "Everything you do, you have to consider your disability and how to get around… I usually try to learn about the place - a lot of times if I'm driving, I google map it. I try to look at it – to be familiar with it. Know what's coming, prepare for it. If I'm going to a new friend's house – I'll ask where I should park, etc. I just try to see if there will be an obstacle, so I can prepare, and make it not be as big of an obstacle. Have a plan in place."

The differences in attitudes in preparation could stem from the participants' differences in levels of conscientiousness. Participant A is about average (58th percentile), while Participant B is higher at the 72nd percentile, potentially explaining why one is more likely to plan ahead than the other.

Person-Environment

This category includes how participants described the interaction between themselves and the environment and how they responded to it. There were three themes that emerged within this category: calibration of challenge: setting (how participants use setting to increase or decrease the level of challenge experienced), calibration of challenge: behavior (how participants adapt their behavior to respond to a challenge), and calibration of challenge: peer supports (how and in what ways participants rely on their buddy supports to respond to a challenge). These themes are explored and expanded through quotes provided by each participant.

Calibration of Challenge: Setting

Participant A: "Before I started scuba diving, I figured the underwater swimming would be tiring – arms are not as strong as legs. More draining. It can be a bit dark (NE waters), you might not see so much stuff. When I started taking lessons in Rhode Island, that's exactly how it was. The water was really murky. I don't think I would scuba dive there much. But in the Bahamas, Bonaire, or Cozumel. It's not as draining as I thought – boat dives (Caribbean) are easier than shore dives (NE). Less draining, more to see. I thought it wouldn't be as thrilling as it was."

Participant C: "I definitely want to get back in the ocean. It's more challenging, but it's a lot better experience because you get to see everything – there are so many things to look at… something new every time…. When I'm in the pool, I'm able to experiment with different things. Knowing that I'm in a safe environment, I get to see what I can and can't do."

Calibration of Challenge: Behavior

Participant A: "Swimming against the current. It's only my hands – so that's definitely a challenge. Getting the confidence to know where to navigate, minimize the distance to swim… You can find areas where there is less of a current. You can drop to the bottom… understand how the flows work… use obstacles to your advantage. I can go to a place where there is not strong current & dive there."

Calibration of Challenge: Peer Supports

Participant A: "If there wasn't this support system (Diveheart), I'd never be able to take my camera."

Participant B: "Without Diveheart & buddies, this would be impossible. I would never be able to dive. It's really a group effort to let me get to dive… I can't just say I'm going diving

today, I'll call a boat. It doesn't work that way. Wow, I really couldn't do this without you guys. Just wow. It's just awesome."

Participant C: **"**I think when I'm in the pool, I don't rely on my buddies as much. I'm more independent. In the ocean, I rely on my buddies more. I feel a little bit more unsafe in the ocean, but it doesn't prevent me from trying… participating."

Environment

This category includes how participants described the environment experienced while scuba diving. There was one theme that emerged within this category, interaction with nature, and one subtheme, other worldliness. These are explored and expanded through quotes provided by each participant.

Interaction with Nature

Participant A: "When you're down there, and you see all this stuff. The sunken ships. I like the artifacts. The sunken ship was pretty awesome… The colors. I've seen it in pictures, but it's just ridiculously colorful. Even in my own pictures. That turtle was pretty fascinating. The pace of how the coral grows. That's interesting – how these reefs are formed, how sensitive they are. Just the types of life that exist. Nudabrinks. Those are pretty fascinating. That kind of thing. Just the different life."

Participant B: "The most surprising part is how beautiful it is under the water – all the life there is. How brilliant the colors are – the coral and the fish."

Other Worldliness

Participant A: "I like the 'out of this world' thing – the views under water. The new interesting, different life."

Participant B: "It's being in another world. It's surprising in the sense that you're taken with a whole new world. You know that there is a world under there, but until you see it, you don't have a true comprehension of what it's like. 'Same planet, different world' – dive log. The city is above, with a diver below. So appropriate so I bought that one."

Participant C: "It's a lot better experience than just diving in the pool. It's like being in a whole new world."

Person-Person

This category includes how participants described the interaction between themselves and their able-bodied peers when not in a dive buddy relationship. There were three themes that emerged within this category: able-bodied peers: hindrance versus support, able-bodied peers: alienation versus equality, and able-bodied peers: willingness/unwillingness to teach others. This category saw the largest polarization in experience and reflection. Participant A was the sole dissenter in each of these themes, which likely stems from his low levels of agreeableness (19th percentile) as compared to Participant B (93rd) and Participant C (65th). These themes are explored and expanded through quotes provided by each participant.

Able-Bodied Peers: Hindrance versus Support

Participant A: "Swimming distance under water – I would like to explore in an area, but if I'm with other people who want to see more and more and more, then I have to adjust my pace. The pace is more than what I care for. I would rather stick around closer to the boat. Fine tune my camera & my settings. Other people want to move on to other things."

Participant B: "Good group of people, with a common goal. There's cohesiveness among the group. We all bond. The people are extra – ordinary! They want to help. They are there to

help… It was a community thing. The camaraderie of being able to dive together from all over the place. I thought that was really cool."

Able-bodied Peers: Alienation versus Equality

Participant A: "It's something that is not very much understood – other people don't understand it. The more of these things I do, the more the everyday people I work with in corporate finance, it's out of their realm. In some sense, engaging in something like scuba diving tends to alienate you from other people if these other people don't view it as their style – work, go home, watch a movie. You can go on a trip somewhere in Europe – the history, the cities… all these wonderful things. Because of your job, and where you work, people will ask you about your trip… but they don't really care – they could have just read a book about all that you spent all that money on."

Participant B: "Sometimes when you live in a world of able-bodied people, you feel like you're on a different level than everyone else. 'OH, you can DOOOOO that?!!?!' doing that makes me feel equal – equal to other people. Strengthen my abilities to live life to the fullest."

Participant C: "When I let people know that I do scuba diving, they are really impressed. They never think a person in a wheelchair can scuba."

Able-bodied Peers: Willingness/Unwillingness to Teach Others

Participant A: "I'm not sure I want to be on display like that – I'm gonna tell my buddy Jimmy Joe about seeing a guy with crutches going diving. I don't want to be a display piece. I feel like why would I need to educate anyone that people with disabilities can dive? I suppose it'd be good for people with disabilities to know… but they can just find that on the internet and do it themselves."

Participant B: "The whole thing, from my understanding, is to gear it towards the positive aspects that diving has on people with disabilities – but it not only has a positive effect on them, but it's also having a positive effect on people who are getting trained and helping. I think it's a win-win situation every way that you look at it. You're kinda like a guinea pig, but that's ok. It's worth it."

Enabling/Disabling Factors

This category includes how participants described the attributes that they perceive as enabling or disabling. There were five themes that emerged within this category: calibration of experience: setting (how participants choose their setting to have a specific experience), calibration of experience: dive buddy supports (how dive buddies affect a participant's experience), barriers to scuba diving: gear (the role gear plays in a scuba experience), barrier response: behavior (how participants respond to barriers by adapting their behavior), barrier response: peer support (how participants respond to barriers with the support of their peers). These themes are explored and expanded through quotes provided by each participant.

Calibration of Experience: Setting

Participant A: "I would have to see where they are going – leaning towards Bonaire instead of Cozumel. Not drift diving – more color. More fish. Better for pictures. Didn't get good pictures there – big minus… Some of the spots where we went – it looked a little more barren than I was expecting – probably from the hurricanes, the current. I was expecting lots and lots of coral – but there were some stretches that were barren. Compare to Bonaire – 90% of the diving was coral & fish. It was all over the place. In Cozumel, 90% of the dive – not a lot of fish. 50% you didn't see fish."

Participant B: "I like least having to put the wetsuit on and putting on all the gear… being wet between dives. That's why I like diving in Florida. I don't have to wear as many clothes."

Calibration of Experience: Dive Buddy Supports

Participant A: "I don't want to be a teaching aide." Adding, "they handled my tank more than was necessary. They did too much for me."

Participant B: "The team figured out how to be supportive and helpful. The communication with the primary and secondary buddies went well. It really helped me be and feel independent." She adds, "I need a lot of help. I can't just jump on any boat at any time; I can't just join in with any group."

Participant C: "I really enjoy working with the buddies. They are there to help, but they can teach you so much about how to be a better diver as well. Overall, though, the goal is just to have fun."

Again, these differences in evaluation and interpretation of the role of dive buddy support likely stem from the different levels of agreeableness across participants.

Barriers to Scuba Diving: Gear

Participant A: "The whole set up – transporting gear from Point A to Point B - even though people help me, I still don't like it. There's a lot of gear – is it all here, where is it? Don the gear. Getting ready. That part is the least enjoyable… Once you're in the water, it isn't challenging. The challenge is getting into the water."

Participant C: "Although scuba diving requires a lot of gear and setup, you are free to move in the water how you want, without gravity. My other sports require much more muscle activity and energy."

Barrier Response: Behavior

Participant A: "The people on the trip, they were very helpful, but in general most people aren't. I mean, that's a different subset of people. While on that trip, most people were OK or

didn't mind carrying stuff or helping out, but I think for buying food or groceries or anything like that, I guess people aren't there really. The store workers – they could help. More educated to help… I ask the store workers to help. If I go to Best Buy and buy a TV, they put it in the car, no problem. Same thing with Staples and boxes. With grocery stores, if I go shopping, they help out and they do that. It probably is part of their job – as part of the sale. In general, yeah, I do that. But only for the people who work there. If they aren't there, I will buy smaller things in multiple trips or get a cart and push it and struggle. Not fun, but you know… I tend to get takeout or go to my parents' place. If you need to go shopping and bring a lot of stuff, that's a barrier. If you go to lunch, the people I work with, they carry my stuff. I don't like to ask for help though – so even if they are more than willing to help, that's in the back of my mind. Sometimes it's easier to drive through or order at a restaurant. Cafeteria at work can be difficult to decide what to eat and how to carry it. Do I take a tray? A drink? I will opt for a sit-down restaurant or eat at the bar. I will opt for takeout. I try to order groceries and have it delivered, but it's more pain than it's worth. Things go bad. Whole Foods is good. I'll go there sometimes and ask the person who works there to help carry. And I'll order something and eat it at the store. It's easier – they work there. It's different than asking the people I work with."

Participant B: "The one [barrier] I've been facing the most recently, the bad weather up north has caused people to flock to Florida. All the handicapped parking spaces are full. Since I have the van, it's difficult to find a place where the ramp has space to unroll. Especially at Costco. I couldn't even find two spaces to take. Everywhere I go, I feel like I have to face this – people block the access aisle. Usually, I park far away and take two spots. Sometimes it makes me think twice about running an errand. Basically I just have to park far away. People don't realize that when they take an access spot & don't need it, they are preventing those who do need them from doing their errands."

Participant C: “Depends on the experience. Usually I try to find a different way to get in or ask for help to get through…. I’ve learned to problem-solve better; to figure out a different way to do things… I probably try to think things through more. Like, I try to figure out if there’s a different way other than asking people for help.”

Barrier Response: Peer Support

Participant B: “I’ve learned the power of teamwork. It helps me to overcome that challenge. Not just overcoming that challenge, but that it helps me…. I’m so used to being independent because I live alone. In society, they don’t know how to handle someone with a disability… or they are just only about me me me me. So when I meet people through Diveheart, It’s just such a warm experience. There are these people who want to help, they just get it… so it helps me learn to accept that help. It’s not always that way. I just have to struggle along on my own, usually… I apply the experience of Diveheart and the teamwork – maybe I need to be more willing to receive help. Maybe I think ‘I’ve got to do this myself, I need to do this myself,’ rather than being open to the help and learning how I can contribute to them.”

Outcomes

This category includes what participants described as the benefits of scuba diving. There were three themes that emerged within this category: feelings of freedom, benefits: health, and benefits: quality of life. These themes are explored and expanded through quotes provided by each participant.

Feelings of Freedom:

Participant A: “In scuba diving, I’ve understood that my arms are a substitute for my legs in moving me through the water. Since arms are not as effective as legs under water, I don’t travel as far. I see this same relationship on land when having to walk a long distance…

Under water, I feel my body and me are more in sync. This is probably the result of no effort being expended to support it and effort only to move it. Walking has effort expended to both support and move it (all my arms)."

Participant B: "Having the freedom of the water – being gravity eliminated. I get to swim, move around, have that freedom. I don't get to have that on land when there's gravity. My paralyzed body doesn't want to move that way."

Participant C: "[Diving] gets me out of my chair, and I'm able to be free in the water, to be able to move around freely."

Benefits: Health

Participant B: "Therapeutic in many ways – mentally, emotionally & physically. It helps me exercise – seems like it decreases my pain level, increases serotonin. When I'm out doing things I love, I'm happier… I just want to reinforce the positive affect that scuba diving has had on me physically, emotionally, and mentally."

Participant C: "Diving improves my back pain. I have a lot of lower back pain and I always feel better once I'm in the water."

Benefits: Quality of Life

Participant B: "I feel more confident in doing something new. Working with a group of people to make it happen. I feel like I have a more positive attitude after diving because I feel like… Being disabled has been hard. I didn't always know I was going to survive – being in and out of hospitals… but doing something 'normal' – being able to participate in life, do things that would seem like obstacles… be a full participant… it gives me hope, encouragement, a new strength, and a new desire to keep pushing forward… to keep active, to be involved. It's a life changing thing for me. It makes me feel human."

6. Discussion

This study had two aims: to identify the psychosocial benefits of scuba diving and the roles that challenge, external supports, and setting play as well as to determine whether a person's relationship with the common barriers in their daily lives changes after scuba diving. Below, the data is discussed in relationship to each of the study's two aims and their corresponding hypotheses, and a determination is provided whether they are consistent with the data or not.

Aim #1a: *Identify the psychosocial benefits of scuba diving for people with physical impairments.* ***Aim #1b:*** *Specifically, how do challenge, external supports, and setting contribute to those benefits?*

As all dives for all participants (except for Dive 3 for Participant A), fell within the Zones of Maximum Comfort and Maximum Performance Potential of the Competence-Environmental Press Model, it was expected that all hypotheses from study Aim #1 would be supported by the data. While Participant A experienced negative affect (frustration) from the addition of too much support during Dive #3, no one described any dives as being too demanding or challenging for them. While diving should always reflect and plan for a diver's unique competency level, without examples of extreme challenge, these hypotheses cannot be analyzed fully without the full spectrum of person-environment fit present. With this caveat acknowledged, each hypothesis and the relevant data are independently presented and reviewed below.

Hypothesis 1.1: When participants report a match between the environmental demands and their competencies (i.e. the challenge experienced falls within C-EPM's Zones of Maximum Comfort or Maximum Performance Potential), they will experience positive emotional

responses and psychosocial benefits. If the dives offer too little or too much press, however, then participants will exhibit negative affect and maladaptive behaviors.

Overall, the data was consistent with the hypothesis in relation to the impact for the individual, but offered mixed results for scuba diving's impact on the divers' social lives. Specifically, participants appeared to more readily acknowledge the benefits related to themselves personally, but not all participants mentioned any social effects or when they did, they would offer conflicting commentary.

In regards to personal benefits, all participants mentioned the feelings of freedom that scuba diving provided them. Carin-Levy & Jones (2007) found similar results, but linked it to feelings of equality that people with physical impairments felt towards their able-bodied peers. In this study, however, feelings of freedom appeared independent from the comparison to others. In fact, Participant A stated that scuba diving sometimes alienated him from his peers back home since they are not divers themselves and cannot relate to his experiences, whereas Participant B stressed its importance in making her feel equal to her peers. In this study, feelings of freedom were more closely linked with the freedom of movement or freedom from mobility devices rather than freedom of impairments as Carin-Levy & Jones (2007) had suggested.

Additionally, two participants highlighted benefits to their physical and/or mental health that they have received from scuba diving. They both expressed a decrease in pain level, while one further suggested that scuba diving helped with her feelings of depression. Although they were the two participants with the highest level of functional impairments (i.e. lowest competency on the Competence-Environment Press Model), it is impossible to extrapolate why they experienced gains in health while the remaining participant either did not or failed to mention any during the interviews. Since this theme was neither presented in previous research nor in the three theoretical frameworks discussed in the literature review, it is important for

future studies to have a larger sample size in order to investigate this benefit more thoroughly and purposefully.

On the aggregate, 21 out of 23 dives provided positive emotional responses from participants, and of those, 11 elicited an increase in emotional wellbeing. For the two dives that resulted in a decrease in positive emotional response, the participant expressed frustrations with his gear and his dive buddy support system, and not from the environmental demands required during those dives. This suggests that the participants enjoyed the experience that scuba diving affords as long as the external supports match a diver's needs, which supports the Recreationist-Environment Fit Model's concepts of requirements-abilities fit and needs-supplies fit (Tsaur, Liang, & Lin, 2012).

Hypothesis 1.1a: When participants report a match between the environmental demands and their competencies (i.e. the challenge experienced falls within C-EPM's Zones of Maximum Comfort or Maximum Performance Potential), they will experience increased feelings of confidence. If the dives offer too little or too much press, however, then participants will note a decrease in feelings of confidence and self-efficacy.

The before-and-after results capturing the change in confidence level was inconclusive. Of the 23 total dives, 5 resulted in an increase in perceived confidence, 3 resulted in a decrease and the rest remained constant. That said, no participant ever reported being "not confident" in their ability to dive, and nearly all responses were either "mildly confident" or "confident" (22 out of 23). Possible reasons for the lack of significant change is that either the scale for confidence was not sensitive enough or the participants in this study's conceptualization of their confidence was relatively stable over time since all divers were experienced. Carin-Levy & Jones (2007) linked confidence to the enhancement of self-concept through increased feelings of control, achievement, and independence, which may prove a better context than the repetitive subjective rating of confidence alone.

Hypothesis 1.2: *When a person reports a match between the adaptive equipment needed and supports received (i.e. the extra-individual supports as highlighted within D-EPM and R-EFM), they will experience positive emotional responses and increased feelings of confidence and self-efficacy.*

Overall, the data was consistent with this hypothesis. As discussed in Hypothesis 1.1a, only two dives resulted in a decrease in positive emotional response, which were the result of a gap between the supports needed and the supports received. In the needs-supplies fit of the Recreationalist-Environment Fit Model, a person must feel adequately supported by the equipment, facilities, and professional staff in order to receive positive benefits from their participation (Tsaur, Liang, & Lin, 2012). When an imbalance occurs, as with dives #1 and #3 for Participant A, a person is removed from the ability to experience flow and it may negatively affect their feelings of self-efficacy and recreational satisfaction (Tsaur, Liang, & Lin, 2012). It is important to note, however, that the effects of lopsided support could have been felt more significantly by Participant A as he presents with extremely low levels of agreeableness (19th percentile).

When examining these two specific dives and their effects on a diver's confidence, however, it appears as if problems with gear are less likely to impact one's perception of their confidence as the addition of too much peer support does. While the measure of confidence used in this study may prove problematic, the comments provided by the participant at the conclusion of Dive #3 were particularly enlightening: "I don't want to be a teaching aide," adding, "They handled my tank more than was necessary. They did too much for me." It is possible that adaptive divers may interpret the addition of too much support from their dive buddies as a reflection of how their able-bodied peers assess their competency. With the addition of too much support, it may not only negatively impact their confidence, but their perceptions of competency and self-efficacy as well.

Hypothesis 1.3: *When a person reports a match between the peer supports needed and the supports received (i.e. the extra-individual supports as highlighted within D-EPM and R-EFM), they will experience an increase in confidence and express fewer perceived differences between themselves and their able-bodied peers.*

The results from this study were not consistent with this hypothesis. Even though 22 out of 23 dives resulted in the appropriate calibration of peer support, no participants mentioned or discussed any observations regarding the relative similarities or differences between themselves and their able-bodied peers. One possible explanation might be that the difference in skill level present during this trip might have been too great for the adaptive divers to naturally compare themselves to their able-bodied peers. The peer relationship articulated in the interviews was more reminiscent of a mentor-mentee relationship, where there was a foundation of help rather than strictly a social one. Had there been more novice-level able-bodied divers or more advanced adaptive divers, the results may have been different.

Hypothesis 1.4: *As the open ocean setting is more engaging, challenging, and interactive, the psychosocial benefits will be more pronounced among its participants than those who dive in a pool.*

This hypothesis remains largely hypothetical and untested as each participant only scuba dived in one setting during the study, and only one participant had repetitively dived in a multitude of environments in the past. When presented with questions regarding the importance of setting on the experience of scuba diving, all participants emphasized the preference for open ocean diving as it would be more challenging, engaging, and interactive. There was also consensus that diving in a pool would allow for the safe and relaxing sharpening of skills, however. From these discussions, it became apparent that it may not be setting that has an effect on the psychosocial benefits of scuba diving, but rather the calibration of challenge provided within these various settings. For those who are able to dive in more complex settings,

diving in a pool is perceived as boring or not challenging enough, potentially placing them in the negative affect and maladaptive behavior section of the Competence-Environmental Press Model. With the addition of task-based learning, however, the value of diving in a pool seems to increase for each participant, maybe pushing the person-environment fit back towards positive outcomes.

Aim #2: *Investigate whether conquering challenge within an unconventional environment (scuba diving) affects how people with physical disabilities perceive and experience common barriers during their daily lives.*

Hypothesis 2.1: After scuba diving, participants will express an increase in knowledge, skills, and/or adaptive behaviors that they feel are necessary to combat common barriers in their lives.

Overall, the data was consistent with this hypothesis. When describing common barriers in their daily lives, every participant not only emphasized the unsupportive nature of most built environments, but that their customary response is to adapt their behavior to fit the demands of the situation rather than trying to correct their environments. Even though interventions can be introduced to the person or the setting in order to guarantee or maximize person-environment fit according to the Competence-Environmental Press and Enabling-Disabling Process Models, most often the burden remains on the person to adapt to their environments as few people have the control or the ability to change the built environment outside of their homes.

Although the choice of setting for each dive can be calibrated to the competency of each diver, once the location is selected and the dive begins, it is very difficult to modify the objective aspects of the environment like current, temperature, or visibility. For this reason, scuba diving mimics the lack of control that most people with physical impairments experience when in the public domain. As revealed in this study, that requires each participant to rely on themselves

and/or their peer supports to respond and react appropriately to the environmental demands that they face. While Participants A and C strive to accomplish their daily tasks without the help from others through behavioral approaches like problem-solving, avoidance, and/or patience, Participant B expressed a willingness to accept more help since there could be other valuable activities or events like diving that she would not be able to accomplish or experience without those external supports.

Additional Findings

While outside the scope of the original study objectives, there was substantial data collected regarding how participants viewed themselves and their individual desires for participating in scuba diving. According to person-environment fit theories, three realms must be investigated and measured when researching setting-specific behavior: the person, the environment, and the reciprocal transaction between the person and the environment, but rarely are specific measures regarding how to capture a person's unique attributes discussed or promoted. In this study, no hypotheses were generated regarding who might participate in scuba diving or how their individual perspectives would have shaped their experiences, but several themes and personality-related explanations were uncovered regardless. In order to increase participation within leisure-time activities, it is important to understand not only the benefits from various recreational activities, but also who might enjoy or gain from participating in them the most.

7. Limitations, Recommendations, and Future Directions

Limitations of Current Study

There were four major limitations within this study: 1) size and diversity of sample, 2) lack of diversity of settings, 3) lack of diversity of measures, and 4) no validation of measures. Each limitation will be discussed individually with recommendations offered to cure these shortcomings in future studies.

Size and diversity of sample:

Since there were only two people in the Open Ocean Case Study and only one in the Pool Case Study, additional themes could be uncovered or the strength of existing themes might shift with the inclusion of additional participants. Furthermore, having a greater diversity regarding standard demographics (age, race and ethnicity, etc.), time since and source of physical impairment, and the amount of dive experience might reveal how scuba diving affects various subgroups differently.

Lack of diversity of settings:

In order to draw stronger conclusions regarding the influence setting has on the psychosocial benefits of scuba diving, a greater diversity and number of settings are needed. Beyond pool and open ocean diving, aquariums and lakes or quarries should also be researched as they provide different levels of environmental demand and interaction with nature.

Lack of diversity of measures:

While the augmented dive logs had quantifiable objective measures like temperature, depth, and time spent under water, etc., the majority of the data used to generate the results were from self-reported qualitative and subjective measures. With

the themes discovered in this study, multiple methods should be incorporated in future studies in order to support the statements provided during traditional qualitative techniques.

No validation of measures:

Although all measures achieved face validity at a minimum, there were no tests completed regarding construct or content validity. In future studies, only validated measures should be used.

Future Directions

In addition to the methodological recommendations offered above, future studies should strive to address the following gaps in research: 1) the assessment of a new or modified theoretical model detailing the mechanisms and outcomes expected from participation in recreational activities by persons with physical impairments, and 2) the comparison of the psychosocial benefits of scuba diving to other recreational adaptive sports.

This study was formulated by the influence of three separate frameworks: the Competence-Environmental Press Model (Lawton & Nehamow, 1973), the Disabling-Enabling Process Model (Verbrugge & Jette, 1994), and the Recreationist-Environment Fit Model (Tsaur, Liang, & Lin, 2012). Although each framework provided key components to the general understanding of how scuba diving might impact people with physical impairments, no model was a perfect fit. Without a specialized and holistic framework dedicated to recreation and functional limitations, every study will have different foci or objectives, making comparisons within domains difficult and across domains unlikely.

In addition to the evaluation of a new or modified theoretical model, more studies should provide comparisons between various adaptive sports and what they offer people with physical impairments. Since 56% of people with physical impairments still do not participate in any

leisure-time physical activities (Rimmer, et.al., 2004), it is critical to not only understand what are the barriers and facilitators of participation, but who might benefit most from various forms of recreational interventions.

8. Appendix

8.1 Appendix A: Interview Transcripts

Participant ID: 1

Scuba Trip Debriefing

- **What motivated you to scuba dive?**

Me & my friend were gonna go down to the Bahamas in my plane. Fly down, go to this island for a few days, that island for a few days… then fly back. In planning for this trip, I had been planning this trip all year. It would be the longest flight I would have ever taken, everything was a big deal – customs, flying over the water… rather than just lounging around, lets go scuba diving. My friend Matt had suggested it, so I started googling local businesses and go through training.. but then go to the Bahamas and see all this amazing stuff.

Many years ago, when I was in Florida at my parents place. I had an interest then, I started on the certification then, but I decided to relax instead. I just set it aside. But your question about why even start then – it was just something to do. A good use of my time. I was just bored then. A scuba shop every 100 feet. That intrigued me a little. I had been into fishing and boating. I guess it was just something in my mind that would be worth pursuing, worth exploring – seeing what it was about.

- **How did the experience of scuba diving compare to your expectations?**

Before I started scuba diving, I figured the underwater swimming would be tiring – arms are not as strong as legs. More draining. It can be a bit dark (NE waters), you might not see so much stuff. When I started taking lessons in Rhode Island, that's exactly how it was. The water was really murky. I don't think I would scuba dive there much. But in the Bahamas, Bonaire, or

Cozumel. It's not as draining as I thought – boat dives (Caribbean) are easier than shore dives (NE). Less draining, more to see. I thought it wouldn't be as thrilling as it was.

- **What did you like BEST about scuba diving?**

Photography. I can go down there – I am a gadgets person – not that I spend too much time walking around taking photos, but I enjoy trying to capture something… the colors, the optimization of it. Working with the lighting… buy more gadgets.. shoot it in raw… use Photoshop. I like computers too. A way to relive the trip. When you're down there, and you see all this stuff. The sunken ships. I like the artifacts. The sunken ship was pretty awesome. The adventure, the experience. It's another world. Looking around, seeing all this other stuff. Like Jacques Cousteau. Take one heck of a great picture. Bring it back.

- **What did you like LEAST about scuba diving?**

The whole set up – transporting gear from pt a to pt b. even though people help me, I still don't like it. There's a lot of gear – is it all here, where is it? Don the gear. Getting ready. That part is the least enjoyable. Swimming distance under water – I would like to explore in an area, but if I'm with other people who want to see more and more and more, then I have to adjust my pace. The pace is more than what I care for. I would rather stick around closer to the boat. Fine tune my camera & my settings. Other people want to move on to other things.

- **What was the most surprising part about scuba diving?**

The colors. I've seen it in pictures, but it's just ridiculously colorful. Even in my own pictures. That turtle was pretty fascinating. The pace of how the coral grows. That's interesting – how

these reefs are formed, how sensitive they are. Just the types of life that exist. Nudabrinks. Those are pretty fascinating. That kind of thing. Just the different life. (googling nudabrinks).

- **Would you like to scuba again? Why or why not?**

Yeah, I would. I gotta put more dives on my gear. I want to shoot more pictures. I want to master my skills – enhance my skills a bit. I have this stuff, I want to use my stuff. I want to take better pictures. I want to see more – see more wrecks. See more different fish.

- **What was one of the more challenging aspects of scuba diving?**

Swimming against the current. It's only my hands – so that's definitely a challenge. Getting the confidence to know where to navigate, minimize the distance to swim.

    - **How did you handle this challenge?**

I can go to a place where there is not strong current & dive there. You can find areas where there is less of a current. You can drop to the bottow… understand how the flows work… use obstacles to your advantage. Maybe I can develop something that would propel me like leg fins do. If it's strong, I can't use my camera. If there wasn't this support system (diveheart), I'd never be able to take my camera. Understand the current more, avoid it if need be.

- **What did you learn through scuba diving?**

My classes – partial pressures. 33ft is 1atm. 1 ft every second. Nitrogen nicosis. The physiology of it. The technology behind it. I learned a little bit about fish species, and their habitats. How long it takes for things to rebuild. How sensitive everything is. And how quickly things decay.

- **How can you apply what you just learned to other challenges you face?**

I'm really good about taking a little bit here and there and bringing it out in something else. About partial pressures, and currents. I'm not going to med school, so I won't use the partial pressures – but navigating currents… wind is the same thing – for piloting. Reinforcing to see it in other settings. All this stuff is reinforcement. Boyle's law… maybe you would understand it better in both.

- **What changes, if any, have you experienced in knowledge, skills, attitudes, or feelings as a direct result of scuba diving?**

Knowledge - There's a whole lot to see in this world. Prior to scuba diving, I thought I had done a lot – flying, nyc, skiing. Then comes scuba, there's all this new stuff to see. It's just so awe-inspiring to see what's down there…. And the sunken history. It enhances an appreciation of nature and what's left to be explored.

Skills – those skills really show up in diving, but they display in cause & effect as well – analytical thinking.

Losing colors underwater – the blues and oranges… shutter speed, whites. Underwater is very different than on land. White balance corrections. Just different skills. Different things to do in photoshop.

Attitudes/Feelings – it's something that is not very much understood – other people don't understand it. The more of these things I do, the more the everyday people I work with in corporate finance, it's out of their realm. In some sense, engaging in something like scuba diving tends to alienate you from other people if these other people don't view it as their style – work,

go home, watch a movie. You can go on a trip somewhere in Europe – the history, the cities… all these wonderful things. Because of your job, and where you work, people will ask you about your trip… but they don't really care – they could have just read a book about all that you spent all that money on.

- **What advice would you give someone with a physical disability who was considering scuba diving?**

Try it. Do it. See if you like it. I can't say that it's an automatic thing – that everyone will love it. You can't say that. I would say try it. If it was aviation, and not scuba diving, I would tell them if you like engines and risk management, curiosity and you like to fly, and flying history, then that would be a good fit for you. Get a pilot's license. For someone who has a physical disability – do you like the water? Do you like the beach? If they hate it, then it wouldn't be a good fit for them. But they like the sun and the water, and that kind of atmosphere, and it's something they enjoy, adventure – then I would definitely open their eyes to scuba diving. What kind of stuff is down there? If their questions are in line with what someone who likes scuba diving, then they should try it. I would recommend it, but I wouldn't say it's an automatic just do it thing. I don't think that would be fair to everyone – just to rubber stamp it. You can certainly do it, if you want to do it, and here's why I like it, and here's what you'd see… and address any concerns they may have.

- **What do you do to stay active?**

I can be more active, but work gets in the way. I can always say that I should join a gym and exercise more. It's easy to sit back and relax – especially on a Friday.

(How often do you fly?) I am having work done on my place – 1x every 1-2 weeks. 1 to keep the airplane and skills healthy. Depends – if it's windy or if it's crappy out.

- **How does this compare to scuba diving?**

How does flying compare to scuba diving?
In flying, there's a lot more monitoring going on – your position, what's happening… it's more like there are these signals, what are they telling me… you're always preparing. You're always thinking 5 minutes ahead. Risk management fit in flying. That is the essence of it. Management.

With scuba diving, not as much. You're there, you're looking around… yeah, you don't want a free ascent, or uncontrolled… it's sightseeing.

In flying, you never know enough. There is never a limit – it's a license to learn, not an end point. Understanding weather patterns – how to forecast what you might experience. The engines, the technology. In scuba diving, you're looking around a lot… it's more serene. There's a lot to learn there too – the plants, the species, but … both things are similar, in flying there is more interesting type of learning – the engines, systems, etc.

- **Is there anything you'd like that I haven't asked?**

I don't think so. I like scuba diving, I mean, I definitely do. I like snowmobiling. And camping. I have a lot of activities, but at the top is aviation. A good chunk of that is that I own an airplane. I like scuba diving. I like photography. All these things… but flying has a lot of things… well, so does scuba diving. There's just so much to do. At this point, I can say that I have done everything that I've wanted to do. Well, there's always travel… but I never would have thought that at this point, my interests are more in deepening my skills in certain activities. But not jumping into another endeavor.

Participant ID: 7

Scuba Trip Debriefing

- **What motivated you to scuba dive?**

Adventurous person. I'm an athlete. I like physical movement. I like being involved in sports. I've always loved water sports… so the diving was something I always wanted to do… but it wasn't until I got hooked up with Diveheart that I felt comfortable trying – they were trained.

(How did you learn about Diveheart?)

Jim Elliott was in Florida and teaching an instructors course. The coursework was in Shake-A-Leg, Miami - where I sail. Pool sessions – I had been there shelling on Saturday. I heard they were doing the pool sessions, so I swung by and saw all the teaching and how intense it was & how they were being trained so seriously. There were 4 of us in the class – 4 disabled.

- **How did the experience of scuba diving compare to your expectations?**

The experience was better than my expectations because I was nervous. I was putting my life in someone else's hands. I was apprehensive. Once I got comfortable in the water, and went on trips, the experience was better than I had thought it would be. Without the help of people like Diveheart and the buddies, it seems like it's beyond my reach. I can't just say I'm going diving today. I'll just call a boat. It doesn't work that way. Wow, I really couldn't do this without you guys. Just wow! It's just awesome.

- **What did you like BEST about scuba diving?**

Having the freedom of the water – being gravity eliminated. I get to swim, move around, have that freedom. I don't get to have that on land – when there's gravity. My paralyzed body doesn't want to move that way.

Coral – learning about the fish, the coral… everything.

Trips – good group of people, with a common goal. There's cohesiveness among the group. We all bond. The people are extra – ordinaire! They want to help. They are there to help.

- **What did you like LEAST about scuba diving?**

I like least having to put the wet suit on – and putting on all the gear. Being wet between the dives. That's why I like diving in Florida. I don't have to wear many clothes.

- **What was the most surprising part about scuba diving?**

The most surprising part is how beautiful it is under the water – all the life there is. How brilliant the colors are – the coral and the fish. It's being in another world. It's surprising in the sense that you're taken with a whole new world. You know that there is a world under there, but until you see it, you don't have a true comprehension of what it's like.

"same planet, different world" – dive log. City above, diver below. So appropriate so I bought that one.

- **Would you like to scuba again? Why or why not?**

Absolutely! Because I love it. Because it's fun. Because it's good for my body. Decreases my pain level. Something about being in the water, the pressure, or the freedom of movement decreases my pain. It's like I'm given an antidepressent – my outlook is even more positive than before. I'm on a high from the trip. It's a social event – we're sharing this event together. We're learning. It's something new – always learning, always experiencing something new. I want to zero in more on plant life and animal life. Feeling comfortable enough to concentrate on something more than just myself. I can add even more to the experience.

- **What was one of the more challenging aspects of scuba diving?**

The fact that I can't walk, and I have to get lifted on and off the boat with the wheelchair, and getting lifted in and out of the water. It's challenging because it limits how often I can dive. I have to line up trained buddies, the boat people have to understand. It's a process to get me to dive. That is the most challenging and limiting to dive as often as I like.

    - **How did you handle this challenge?**

Being around trained buddies with Diveheart.

- **What did you learn through scuba diving?**

I've learned the power of teamwork. It helps me to overcome that challenge. Not just overcoming that challenge, but that it helps me…. I'm so used to being independent because I live alone. In society, they don't know how to handle someone with a disability… or they are just only about me me me me. So when I meet people through Diveheart, It's just such a warm

experience. There are these people who want to help, they just get it… so it helps me learn to accept that help. It's not always that way. I just have to struggle along on my own, usually.

I also learned about the safety, the dynamics of the safety stops – the time between dives… I'm learning all of that. It adds to my life. It enhances my life because I'm learning new things.

- **How can you apply what you just learned to other challenges you face?**

I apply the experience of diveheart and the teamwork – maybe I need to be more willing to receive help. Maybe I think "I've got to do this myself, I need to do this myself," rather than being open to the help and learning how I can contribute to them.

They inspire me because they pay all their money to come help me. It's an awesome feeling to have people who want to help. I guess I can take a lesson from that, that I should be open to people like that. They could just do their tech dives, but they choose to dive with me.

I overcame my apprehension of diving by just being determined to dive. Rather than just say "I'm not gonna try that" – so just being open to other new experiences. Just do it. Don't let your apprehension hold you back. Of course use your wisdom – don't do something stupid.

- **What changes, if any, have you experienced in knowledge, skills, attitudes, or feelings as a direct result of scuba diving?**

Feelings/Attitudes – I feel more confident in doing something new. Working with a group of people to make it happen. I feel like I have a more positive attitude after diving because I feel like… Being disabled has been hard. I didn't always know I was going to survive – being in and out of hospitals… but Doing something "normal" – be able to participate in life, do things that

would seem like obstacles… be a full participant, gives me hope, encouragement, a new strength, and a new desire to keep pushing forward. To keep active. Be involved. It's a life changing thing for me. It makes me feel human. Sometimes when you live in a world of able-bodied people, you feel like you're on a different level than everyone else. "OH you can DOOOOO that?!!?!" doing that makes me feel equal – equal to other people. Strengthen my abilities to live life to the fullest.

- **What advice would you give someone with a physical disability who was considering scuba diving?**

I would give them the advice to get hooked up with a group like Diveheart. Instruction, work through any apprehension. I would tell them to not worry about their apprehensions as they go through the program – they will be addressed as they go along. The programs will cover any questions they may have.

I would also tell them what I do – like if they have skin breakdowns, etc. If they get cold easily… having the poncho – having a customized wetsuit is beneficial. I would basically just share my experience and encourage them to go for it. That it's a life changing experience.

- **How else do you stay active?**

I swim laps 3x a week. In the pool a good hour – swimming 40 minutes nonstop. I can stand in the pool and stretch out my legs.

I sail. Tomorrow I'm doing a sailboat race. I try to do that 2-4x a month. Depends on the races and the weather.

I make stained glass. That's quite a physical endeavor. I can do that almost everyday if I have a project.

- **How does scuba compare to that?**

The thing I like doing the most is scuba diving. I can't do it as readily as some of the other activities. Swimming is a work out. Stained glass is a hobby. Scuba diving is just what I want to do right now. If I could only choose one thing, it would be to scuba dive.

- **Is there anything you'd like to add that I haven't asked?**

I can't think of anything, but I just want to reinforce the positive affect that scuba diving has had on me physically, emotionally, and mentally.

Participant ID: 14

Scuba Trip Debriefing

- **What motivated you to scuba dive?**

A neighbor asked me and it sounds like fun. A lot of it was my husband, though. He really wanted to try it. The neighbor suggested Diveheart. I was a little leery about it, but he encouraged me to go. My husband will pretty much do anything… like he's going skydiving soon, but I would never do that.

- **How did the experience of scuba diving compare to your expectations?**

Yes, it was like nothing I ever did before. It was really cool. It was really awesome. It was more freeing. I would never really be too too comfortable swimming, but you don't really need to know how to scuba dive.

- **What did you like BEST about scuba diving?**

Being free in the water

- **What did you like LEAST about scuba diving?**

Clearing my mask if it gets flooded. I always get water up my nose.

- **What was the most surprising part about scuba diving?**

How light the tank was in the water.

- **Would you like to scuba again? Why or why not?**

Definitely. This is something I will do for the rest of my life or until I am unable.

- **What was one of the more challenging aspects of scuba diving?**

Certain skills, like clearing masks and removing and putting BC on in water

- **How did you handle this challenge?**

Stay calm and not rush through it

- **What did you learn through scuba diving?**

Patience and persistence. Never give up and you will accomplish the task

- **How can you apply what you just learned to other challenges you face?**

Patience and persistence is something that should be used in every task you do.

- **What changes, if any, have you experienced in knowledge, skills, attitudes, or feelings as a direct result of scuba diving?**

When I let people know that I do scuba diving, they are really impressed. They never think a person in a wheelchair can scuba.

- **What advice would you give someone with a physical disability who was considering scuba diving?**

Don't let your disability stop you. It is an amazing feeling to be able to move freely in the water.

- **What do you do to stay active?**

biking, swimming and have tried water an snow skiing and rock climbing.

- **How does this compare to scuba diving?**

Although scuba requires a lot of gear and set up you are free to move in the water how you want without gravity. My other sports require much more muscle activity and energy.

- **Is there anything you'd like that I haven't asked?**

Nope.

Participant ID: 1

Final Interview

- **Have you gone scuba diving since we last spoke?**

No – this place that certified me in Rhode Island – they have a trip in May that they invited me to, but I'm considering this trip. It's to Bonaire, so I'm thinking about it – just need to think about money. Every time you save money, something comes up.

I had thought about going on one of those liveaboards – they have 2 trips coming up. 2016 – indian ocean. Solomon islands. Liveaboard. So many dives per day.

- **Do you plan to dive again? When? With Diveheart?**

Would you dive with Diveheart again? I don't know – I would have to think about that. Maybe, maybe not. I would have to see where they are going – leaning towards Bonaire instead of Cozumel. Not drift diving – more color. More fish. Better for pictures. Didn't get good pictures

there – big minus. I got some, but with the current, you're just moving along – if you want to spend time photographing, you just couldn't. The clarity is effective.

- **Why or why not? i.e. what benefits, if any, does scuba diving provide for you?**

I am certified, I want to dive again because I like the experience. I thought it was fun. I like the "out of this world" thing – the views under water. The new interesting, different life. Again, I like shooting pictures. I like to focus on different subjects – things under water. Experience that. Everything is a trade off- if I go to Bonaire for a week, but then I can't go to California for a week. I do want to dive again, definitely, I would love to go to Bonaire. LOVE to go to Solomon islands – Japanese fleets. The price is ridiculous. They have the most amount of ships in a small area – it's an amazing thing. But then you spend that much money and it really hits you in other areas. Even Bonaire is expensive – probably a bit more than Cozumel. I just need to figure it out. I like to fly too. I could fly to Bahamas, dive and then fly back. It combines everything I like.

- **How would you feel about diving in a pool?**

Um, well, I don't know. Why would I want to do that? What is there to see in a pool? If I put on gear, and I stay down for 30 minutes I may see a couple quarters and a leaf. I might consider it if I could stay down and literally not move for 25 minutes and work on my camera skills. That would be one advantage – test photographing it. Gain skills. If I don't see anything new, different or change, it's not that appealing. A flat panel that had a tv screen that was interactive and could dive and watch tv. That might be cool.

- **Aquarium?**

How much money is that? (let's say it's free). If there was an aquarium in Hartford and see the dolphins and it was free, I don't know. Just because I'm not sure I want to be on display like that – I'm gonna tell my buddy jimmy joe about seeing a guy with crutches going diving. I don't want to be a display piece. I feel like why would I need to educate anyone about people that people with disabilities can dive – I suppose it'd be good for people with disabilities to know… but they can just find that on the internet and do it themselves. It's a balance. So I go to work, I come home from work, I like to relax. I got my own things going on. My own interests – flying or diving, and it's like to I want to volunteer or do something more than that. I like to relax on my weekends. It'd be different if I wasn't working or I was paid to do it. And I had more time. I work a lot of hours. Come the weekend, you almost don't want to have anything on the calendar – no obligations. Not many, anyway. I would have to think about that. I would have to see… I guess I would do it. I would take photos. If I had to do a task while I was under there, I don't think I would want to do that. You also have to wave at the people – then that's a job. It changes it. Ever so slightly, but it does change it.

- **How would the experience change for you depending on the environment?**

See above.

- **What do you remember MOST about the scuba trip?**

The hotel was pretty nice – I got sick of the food though. Drift dive was nice. The people were nice. That street with the cruise ships. I remember most about the diving that was 1 hour long –

interesting. The wreck dive was a good dive. I remember some of the life – the octopus, some of the different life. The stonefish. Nice hotel. Nice facilities. The diving? Some of the spots where we went – it looked a little more barren than I was expecting – the hurricanes, the current. I was expecting lots and lots of coral – but there were some stretches that were barren. Compare to Bonaire – 90% of the diving was coral & fish. It was all over the place. In Cozumel 90% of the dive – not a lot of fish. 50% you didn't see fish.

- **What did you like BEST about the trip?**

Reasonably priced – airfare & hotel. That was a plus. And I used my own equipment. I had all my stuff. Nice people on the trip. I liked the wreck – it was good.

- **What was the most challenging aspect of the trip?**

Walking along that floor in the hotel. Marble floor – mostly wet. Not sure if you were going to trip or not. Where my room was, that was the most challenging.

  - **Is this a common barrier in your life?**

    No, most places don't have that problem. My apartment has carpet. It's brick. It's concrete. Asphalt. No worry on those surfaces – sliding out. Something as smooth as marble and it was mostly wet – that there were spots that were wet. Had this big floor and some spots were wet, and some spots weren't. you just didn't know. I think I fell twice and I was being extra careful. But in my daily life? No. there is nothing that slippery from house to car, car to work. In general no. not a typical concern. If you see

the floor and it's icy. You know you're not going to run. If it's a small patch of ice, it's all good. But if it's the whole floor, then yeah.

- **Think of a barrier you face in your daily life (at home or work). Please describe it for me.**

To carry stuff. When I go to the grocery store, I don't bring 10 bags. I tend to get takeout or go to my parents place. If you need to go shopping and bring a lot of stuff, that's a barrier. If you go to lunch, the people I work with, they carry my stuff. I don't like to ask for help though – so even if they are more than willing to help, that's in the back of my mind. Sometimes it's easier to drive through or order at a restaurant. Cafeteria at work can be difficult to decide what to eat and how to carry it. Do I take a tray? A drink?

  - **How do you overcome this challenge?**

I will opt for a sit-down restaurant or eat at the bar. I will opt for takeout. I try to order groceries and have it delivered, but it's more pain than it's worth. Things go bad. Whole foods is good. I'll go there sometimes and the person who works there to help carry. And I'll order something and eat it at the store. It's easier – they work there. It's different than asking the people I work with.

- **What, if anything, will you do differently when facing this challenge because of the experiences you had while scuba diving?**

The challenge of having a tray and choosing the food and then carry it back to the table….? Um.. well, I don't think scuba diving really helps. The people on the trip, they were very helpful, but in

general most people aren't. I mean, that's a different subset of people. While on that trip, most people were Ok or didn't mind carrying stuff or helping out, but I think for buying food or groceries or anything like that, I guess people aren't there really. The store workers – they could help. More educated to help.

- **Is this something that you do now?**

Yeah, I ask the store workers to help. If I go to Best Buy and buy a tv, they put it in the car, no problem. Same thing with staples and boxes. With grocery stores, if I go shopping, they help out and they do that. It probably is part of their job – as part of the sale. In general, yeah, I do that. But only for the people who work there. If they aren't there, I will buy smaller things in multiple trips or get a cart and push it and struggle. Not fun, but you know.

- **When you're visiting a new place or completing a new task – how do you prepare?**

Nope, it's really sink or swim. I'll jump in my car and I will go and drive around and around and around and they say it's $27 an hour and I will leave, and then drive around and around and around – and not know where to go because there is no map. Or if there is a map, I will walk halfway across the whole thing to find the thing that was next door to begin with. I don't really prepare. I feel like I should just go. Maybe it's laziness. That lack of preparation will cost me though – like I'll pay more for parking. There is a cost with that. In general, I figure it's part of the experience. Places like museums – they have elevators, etc. If I like going some place, I certainly would have those questions. If it's mainstream, just about anything in America – museums, etc. – I don't prepare much. If it's on the fringe, then I would have questions. How would I get there, if I did this, where would I leave my crutches. Like with scuba? Where do I

leave them? On the boat, in the hotel. Most places are pretty good though – don't really prepare. Let's say I want to go ice fishing – I would ask about the ice, about snowshoes, etc. how would I get across the ice? That'd be slippery. I vary the preparation. It depends.

- **What do you worry most about exploring a new space?**

One of the things that I would wonder about is saying I go with a group of people, and they say they're gonna go to Galray (?) and we go wine tasting. Jump in the car, let's go winetasting. The parking is in this far lot and there's no handicapped parking. Then there's a long walk and then there's exploring and we walk and walk and walk. I would be tired. Remember when we got off in Miami and we had to walk and walk and walk through customs? I could do that walk, but in the end, I just want to be comfortable. I could do that. You did it. It was long, but then you have to walk back. They can just do that and not think about it. If you go winetasting, there could be hills, long walks. I could do it one way, but what about getting back? I'd hurt my arms and it would ruin the whole enjoyment of the whole thing. Same thing with camping – those are the things I would research. Most other people wouldn't, but I would.

    - **What attributes of a space let you know that it will be supportive or problematic for you?**

Little things like is there a handicapped parking space or will we have to park far away and then walk. Some of my friends, that's what we do. Park farther away, save money. But that'd be much more in my mind. How much walking is there?

- **I'd like to remind you of the maps we used while determining the challenge level of each dive. Was it useful to see the dive prior to experiencing it?**

Not really. That map could have been upside down to be honest. It would have been about as useful. I do remember them saying they were going to drop us off there and pick us up here – it just didn't make sense. Maybe that's why I got so lost at the museum of natural history!! They just aren't that helpful.

  - **Would that be helpful in your daily life? To envision things in 3-dimensions?**

    Maybe if it was a little bit better – like a "you are here" – that it was oriented better. The map at the museum – by the time you figured out where you were, and where you wanted to go – I just don't think it was drawn to scale. GPS would help. The NY subway map is good. If I had to grade people's map making abilities, some are good, some are really bad. The scuba diving was like a D. the museum was an F. the subway an A. a lot of places have good maps. Vineyards – drive here, park there. Sometimes you won't know how long a walk is until you actually do it. That'd be my experience. Parking here, the building is there – you might not fully grasp how far a walk it is. You may have to stand a lot and wait, etc.

- **Is there anything that diving has done to make you think about space differently?**

I think about outer space differently – when you go underwater, you're protected from that environment, if worse case scenario, and you run out of air, you drop your weight belt, and you

would survive it. In outer space, you couldn't. it'd just be the worst thing. If the water is a harsh environment, then outer space is far, far more extreme. Nothing is more extreme than that?

(Would you ever want to experience outer space?) I did just watch the movie gravity… they didn't have such a fun time. haha. But what compensates for it is the view, so… that view would be amazing. If I knew it was 100% safe and secure, and far more likely to be riskfree, then I would just do it. For scuba diving, that's more tried and tested. Millions of people do that. But for going to outer space, they have many, many factors of safety – many things, on many levels – it still is experimental. In scuba you have your reg, your back up reg and your buddy. I know space has redundancies too, but … if they balance out, I'd be indifferent… but if it's safe and I went with far more experienced people, then I would probably be interested.

- **Any additional thoughts you'd like to mention?**

I was watching walking dead when you called – there's a lot of zombies in that series. End of the world. Zombies all over the place. Good show, but that would not be a good environment for me. I wouldn't be running through the woods, outrunning the zombies, foraging for food – I would not like that very much. If I had a tank, possibly and unlimited gasoline and fuel, or maybe a helicopter. (they never have zombies underwater – maybe you should dive!) zombies are pretty dumb – they'd probably drown if they weren't dead already. They wouldn't know how to close their mouths!

I want to go diving again – to go soon, but my job is literally really busy up until may. I got one week off after memorial day. The whole chunk of the first half of the year – all these deliverables. I just can't take a week and go somewhere. Not a nice thing, but it's just how it goes. I really have to weigh all these things – there's a cost – time away from work, cost to travel.

It would be nice if there was some sort of supersonic plane that could get me to the Bahamas and back. One week of vacation, I want to make that count. Bonaire – I did one underwater dive at night last year, saw all this stuff and it was awesome. I want to do that – there are so many things you can do! Scuba dive, travel to some foreign country – for the price, you could go to Europe for a week. That'd be nice – see Austria – probably same price as Bonaire! 4.5-5.5k for soloman islands. Hartford – Honolulu – right by Australia – probably where that downed plane is. The liveaboard is pure luxury – they carry everything for you. It's definitely a good trip, but that's a big bill! You could go to the Bahamas many times for that price. Always a trade off. Gotta hit the lottery.

Participant ID: 7

Final Interview

- **Have you gone scuba diving since we last spoke?**

No, unfortunately.

- **Do you plan to dive again? When? With Diveheart?**

Yes – if I can raise the money; it'll be in with Diveheart in May. I'm hoping a local program would start up again, but I think there's a hold up with the funding. Hoping soon – the water is getting warmer. By late April, if anyone asked me to join them, I'd go.

- **Why or why not? i.e. what benefits, if any, does scuba diving provide for you?**

Therapeutic in many ways – mentally, emotionally & physical. It helps me exercise – seems like it decreases my pain level, increases serotonin. When I'm out doing things I love, I'm happier. It's inclusive – I get to be around people doing the thing I love.

- **How would you feel about diving in a pool?**

Um, I don't think it would be as much fun as in the ocean. But if it was local & I couldn't go out in the ocean, I would go. I prefer the ocean – it's more adventuresome. There's the coral and the fish.

- **Aquarium?**

I think that would be totally awesome – there's nothing down here, but I know they have that in Atlanta & California. I would love to do that.

- **How would the experience change for you depending on the environment?**

I would think that the ocean would be more challenging & adventuresome. It would be more interesting.

The aquarium would be interesting too, though – so that would be cool.

The pool would be good to be in the water & be gravity-free. If it were really deep or there was something that would be in there as a goal – like a swimthrough. The pool is good for practicing buoyancy, skills. But it would be not be interesting – better for keeping skills fresh.

I would take the ocean over them all - unless it's cold, then I would take the aquarium.

- **What do you remember MOST about the scuba trip?**

Multi-faceted; the excitement of doing all the dives. The dives were great. How cohesive the group was – having the common goal of diving. The buddies being very helpful & willing to learn. It was a community thing. The camaraderie of being able to dive together from all over the place. I thought that was really cool.

- **What did you like BEST about the trip?**

The same as above.

- **What was the most challenging aspect of the trip?**

Just getting there & getting home is challenging – my wheelchair broke on the trip (they dropped it) & they just replaced it a week ago Thursday.

- **Is this a common barrier in your life?**

Yes, it is. Everything you do, you have to consider your disability and how to get around. Just getting in and off the plane – that is a common barrier. Way more when outside your home or your own vehicle.

- **Think of a barrier you face in your daily life (at home or work). Please describe it for me.**

The one I've been facing the most recently, the bad weather up north has caused people to flock to florida. All the handicapped parking spaces are full. Since I have the van, it's difficult to find a place where the ramp has space to unroll. Especially at Costco. I couldn't even find two spaces to take. Everywhere I go, I feel like I have to face this – people block the access aisle.

- **How do you overcome this challenge?**

Usually, I park far away and take two spots. Sometimes it makes me think twice about running an errand. Basically I just have to park far away. People don't realize that when they take an access spot & don't need it, they are preventing those who do need them from doing their errands.

- **What, if anything, will you do differently when facing this challenge because of the experiences you had while scuba diving?**

Just remember, and reflect back on how relaxing diving is, and remind myself to not sweat the small stuff. Just chill out some. Just go with the flow – just like with the challenge to get to the dive site, it's worth it.

  - **Is this something that you do now?**

Oh yeah, I think about it. I think about it all the time. I think about when it'll start warming up and when I can start diving again. The stained glass piece I have in my bathroom reminds me of how beautiful it is (she made it). I look at that every day.

- **When you're visiting a new space or completing a new task – how do you prepare?**

I usually try to learn about the place - a lot of times if I'm driving, I google map it. I try to look at it – to be familiar with it. Know what's coming, prepare for it. If I'm going to a new friend's house – I'll ask where I should park, etc. I just try to see if there will be an obstacle, so I can prepare, and make it not be as big of an obstacle. Have a plan in place.

- **What do you worry most about exploring a new space?**

The physical obstacles – if I don't have someone there that can assist then I won't be able to do it. That's what frustrates me the most.

- **What attributes of a space let you know that it will be supportive or problematic for you?**

If drive up and there are no handicapped spaces, and it's too crowded, it'll be too hard to navigate the place. Lets say I'm going to a new hotel, and you think it'll be accessible and you can't even get into the bathroom. Sometimes people think it's wheelchair-friendly, but it's not. If you see a ramp… there's one spot where our local spot will dive, and there's only one handicapped space… but there's no place for a ramp. You know there's only one space and you know it'll be a problem. When you drive by yourself, it's not like you can be dropped off and someone else can park the car.

- **I'd like to remind you of the maps we used while determining the challenge level of each dive. Was it useful to see the dive prior to experiencing it?**

Yeah, it'll be great to see what you're going to do, what you're going to see. I plan the dive, I plan everything in my life. It was very useful to use.

- **Would that be helpful in your daily life? To envision things in 3-dimensions?**

It would be very useful – to see how to go from parking to the entrance to the bathroom. Especially with a place like a big museum, it'd be a great help to see all that beforehand. It would be very useful.

- **Is there anything that diving has done that has made you think about space differently?**

Yeah, I would say it shows the possibilities. That you would think something that is impossible, but it isn't. things like diveheart, the teamwork aspect, the diveheart group – the goals to get the disabled out and doing new things. They make the impossible, possible. I'm that kind of person, I'm very independent – doing things by myself – working with the group, though, it reiterates what can be done. It's about educating people too – both disabled and able-bodied. Things can be done – it just takes creativity. There's probably a lot of divers who probably think that people with disabilities can't dive until they see it. See how people get in and off the boat. Educating myself too.

- **Any additional thoughts you'd like to mention?**

The whole thing, from my understanding, is to gear it towards the positive aspects that diving has on people with disabilities – but it not only has a positive effect on them, but it's also having a positive effect on people who are getting trained and helping. I think it's a win-win situation every way that you look at it.

You're kinda like a guinea pig, but that's ok. It's worth it.

Participant ID: 14

Final Interview

- **Have you gone scuba diving since we last spoke?**

No. I had a problem with my leg – so I haven't been able to get in the water. If not one thing, it's another.

- **Do you plan to dive again? When? With Diveheart?**

Yeah – definitely. Hopefully I can get in the water next week. There are quarry dives in july, so I really want to do that. They are pretty far south and maybe west from Chicago – about an hour.

    - **Why or why not? i.e. what benefits, if any, does scuba diving provide for you?**

[Diving] gets me out of my chair, and I'm able to be free in the water, to be able to move around freely.

Diving improves my back pain. I have a lot of lower back pain and I always feel better once I'm in the water.

- **How would you feel about diving in an aquarium?**

I would actually think that would be awesome – it's a lot better experience than just diving in the pool. It's like being in a whole new world.

- **Open Ocean?**

I definitely want to get back in the ocean. It's more challenging, but it's a lot better experience because you get to see everything – there are so many things to look at… something new every time.

    - **How would the experience change for you depending on the environment?**

I think when I'm in the pool, I don't rely on my buddies as much. I'm more independent. In the ocean, I rely on my buddies more. I feel a little bit more unsafe in the ocean, but it doesn't prevent me from trying… participating.

I really enjoy working with the buddies. They are there to help, but they can teach you so much about how to be a better diver as well. Overall, though, the goal is just to have fun.

- **What do you remember MOST about the scuba trip?**

When I'm in the pool, I'm able to experiment with different things. Knowing that I'm in a safe environment, I get to see what I can and can't do.

- **What did you like BEST about the trip?**

just the idea of the training – that I can get all that done. Then I can get into the ocean and feel a lot more comfortable with my skill level

What was the most challenging aspect of the trip?

Just diving in a pool – just doing the skills with masks. Clearing in the masks. Just trying to get buoyant and properly weighted in the water is a big challenge.

- **Is this a common barrier in your life?**

I use wheelchairs.

- **Think of a barrier you face in your daily life (at home or work). Please describe it for me.**

Just generally – just making sure there are ramps. Just being out where the sidewalk isn't good to be able to get through using a wheelchair.

- **How do you overcome this challenge?**

Depends on the experience. Usually I try to find a different way to get in… ask for help to get through…

- **What, if anything, will you do differently when facing this challenge because of the experiences you had while scuba diving?**

Maybe thinking things through – how I would get through problem-solving. I've learned to problem-solve better – to figure out a different way to do things.

- **Is this something that you do now?**

I probably to try think things through – I try to figure out if there's a different way other than asking for help.

Depends on the experience. Usually I try to find a different way to get in or ask for help to get through…. I've learned to problem-solve better; to figure out a different way to do things… I probably try to think things through more. Like, I try to figure out if there's a different way other than asking people for help.

- **When you're visiting a new space or completing a new task – how do you prepare?**

Usually I try to figure out where it is and how it's set up. If there are barriers, I try to figure out a different way to do something.

- **What do you worry most about exploring a new space?**

Just being able to get to the place and move freely around.

- **What attributes of a space let you know that it will be supportive or problematic for you?**

Whether there are ramps or if there are stairs – that can be an issue.

- **Would it be helpful to envision spaces 3-dimensionally before experiencing them for the first time?**

Not really – I don't really look at things that way.

- **Is there anything that diving has done that has made you think about space differently?**

Not that I can think of – not really.

- **Does scuba diving make you think about your body differently?**

Well, when I'm in the water, I have to think about how I'm positioned… like balancing in the water – I think of my body in that way. When I'm in the water, if I'm not properly weighted properly, I can roll in the water – I have to force my body to go in the other directions, so I have to force my body to not spin.

  - **Do you have a different relationship with it under water?**

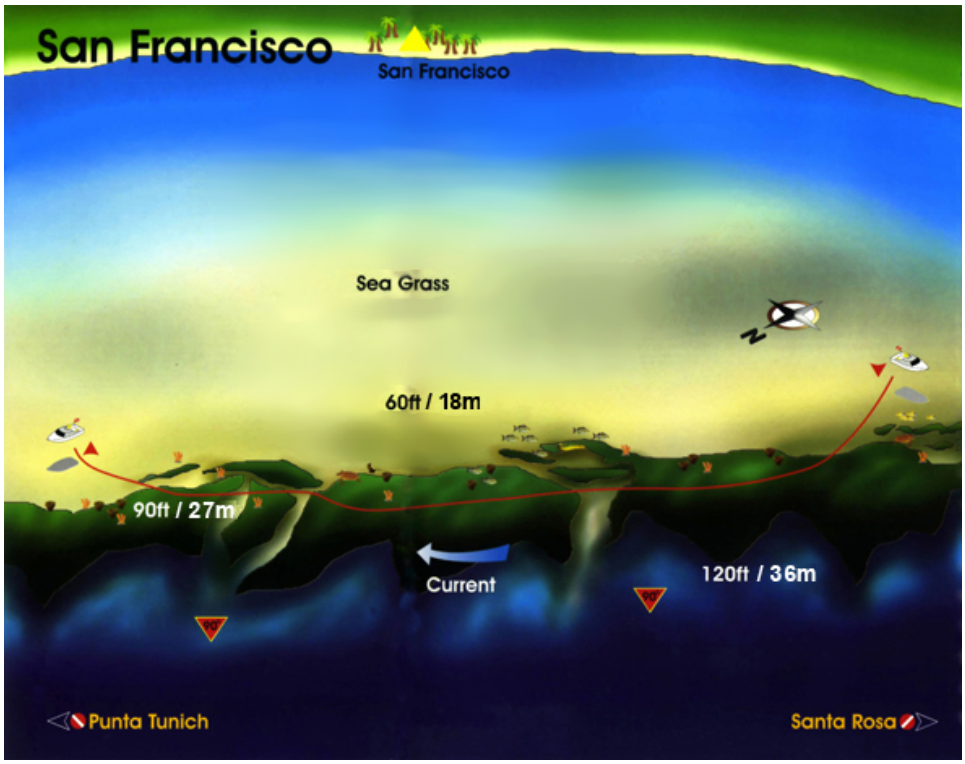
No, not really.

- **Any additional thoughts you'd like to mention?**

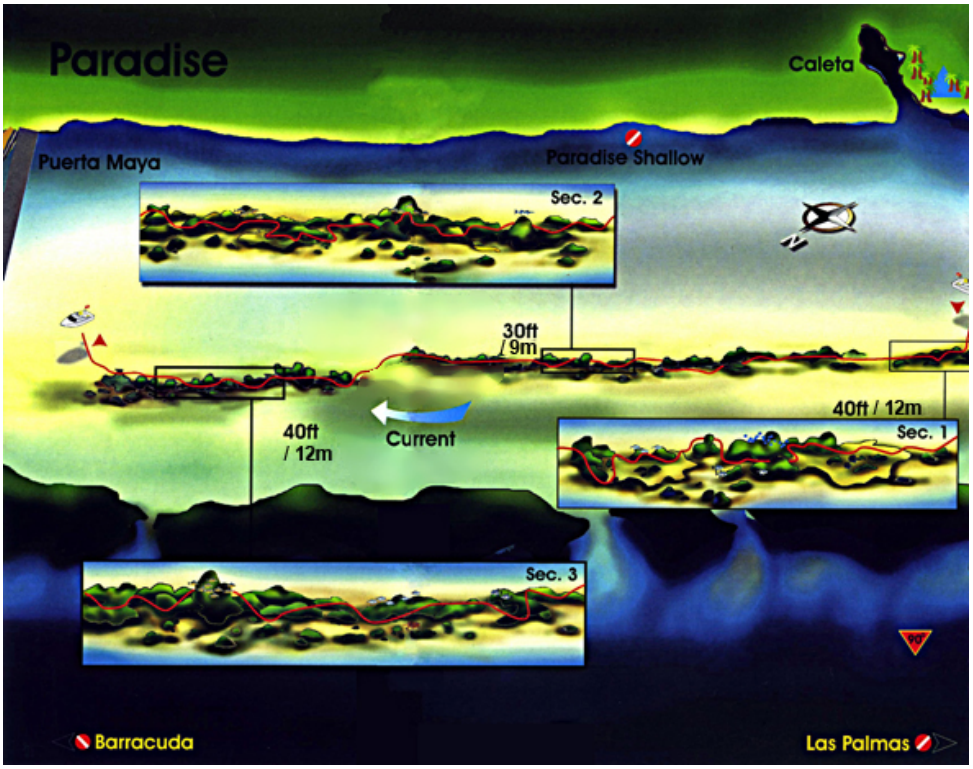
I can't really think of anything.

8.2 Appendix B: Cozumel Dive Maps

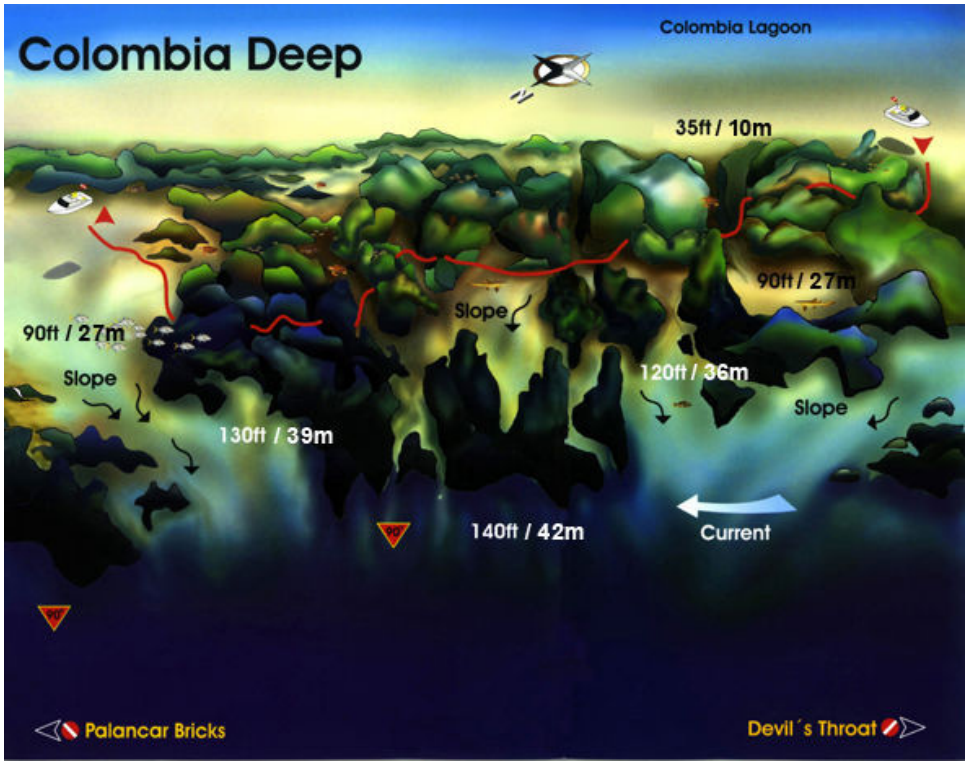
Dive 1: San Francisco



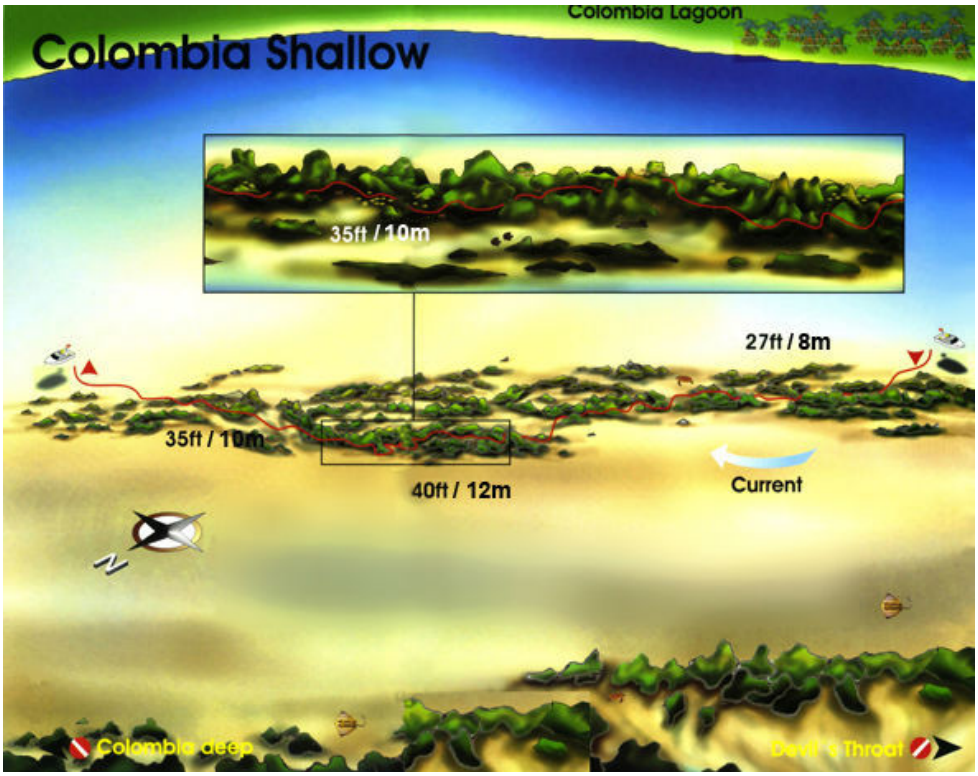
Dive 2: Paradise



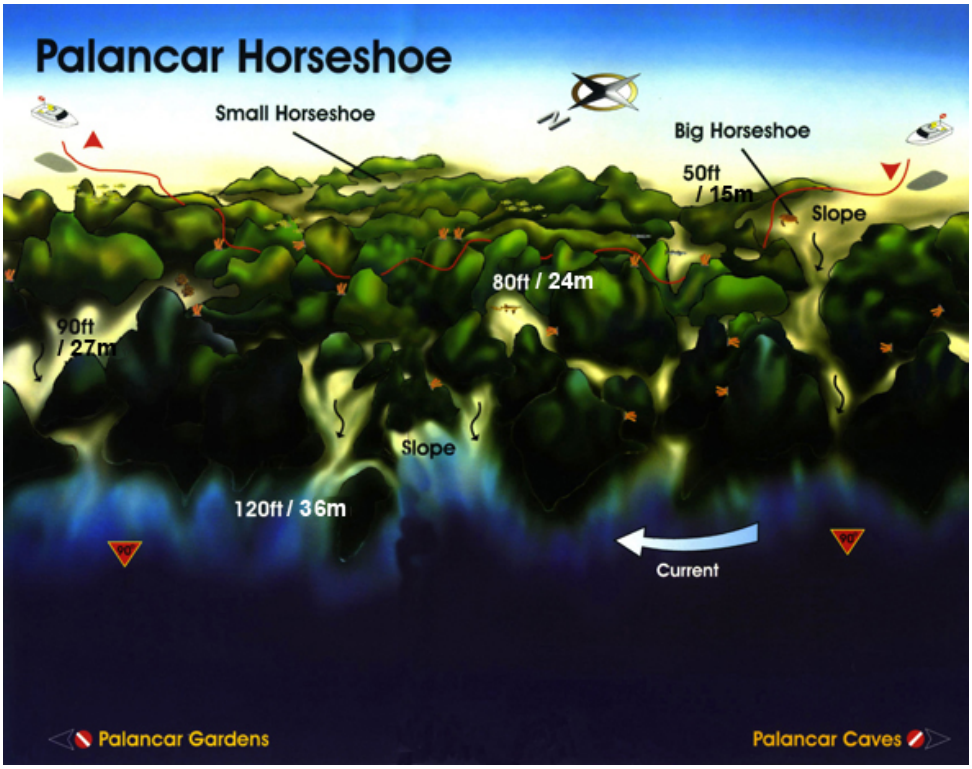
Dive 3: Colombia Deep



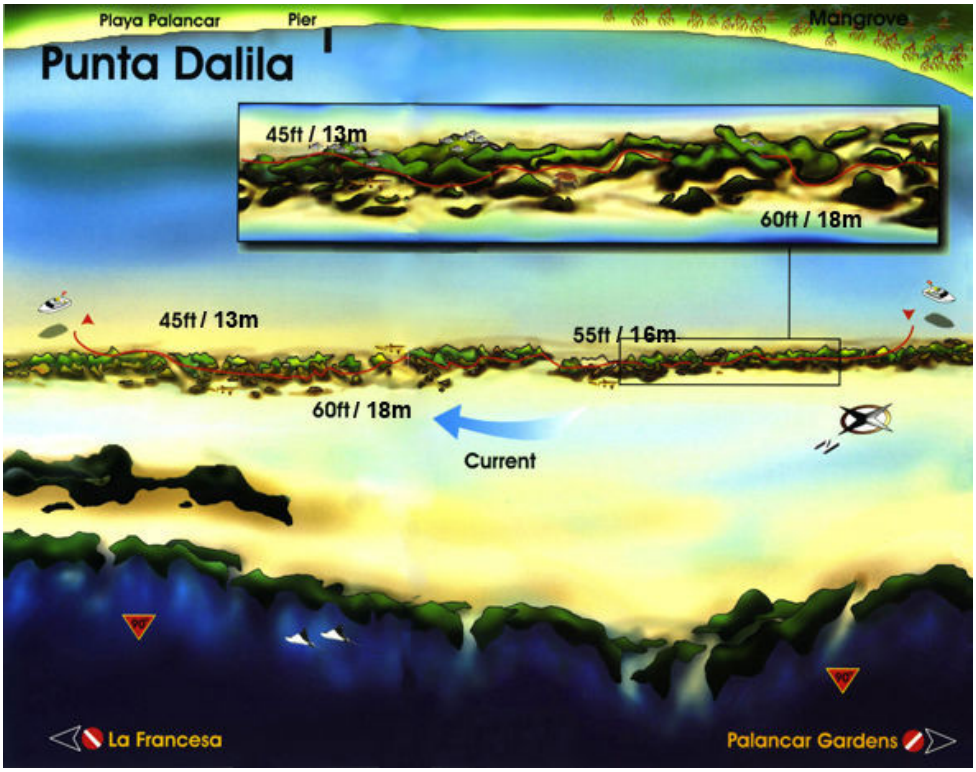
Dive 4: Colombia Shallow



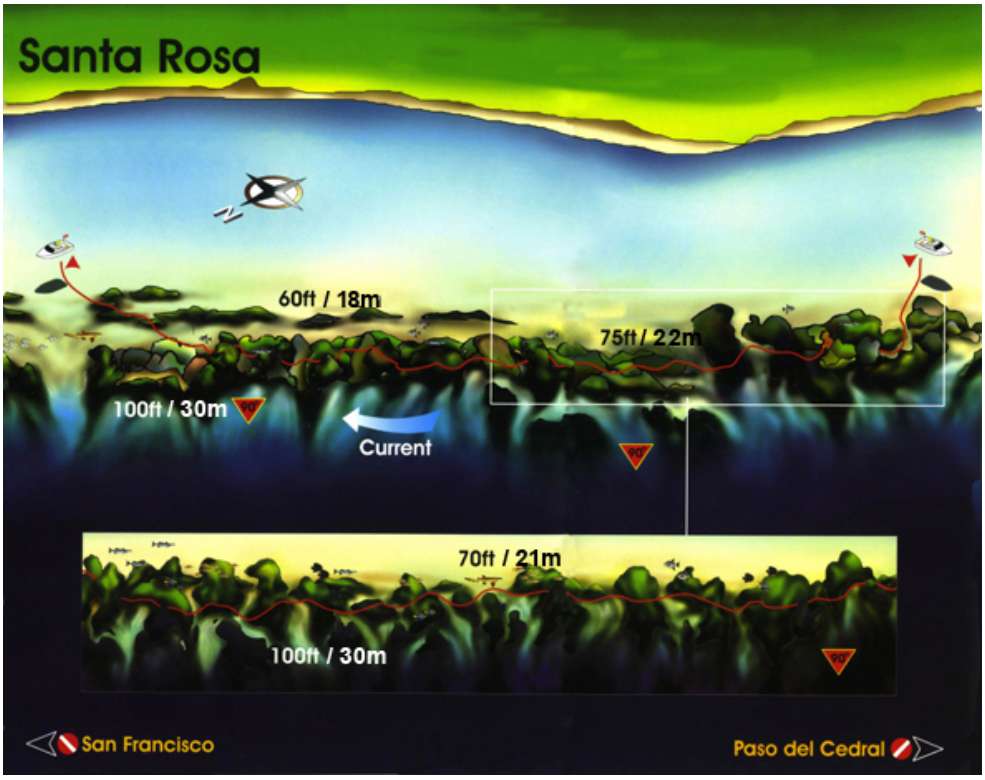
Dive 5: Palancar Horseshoe



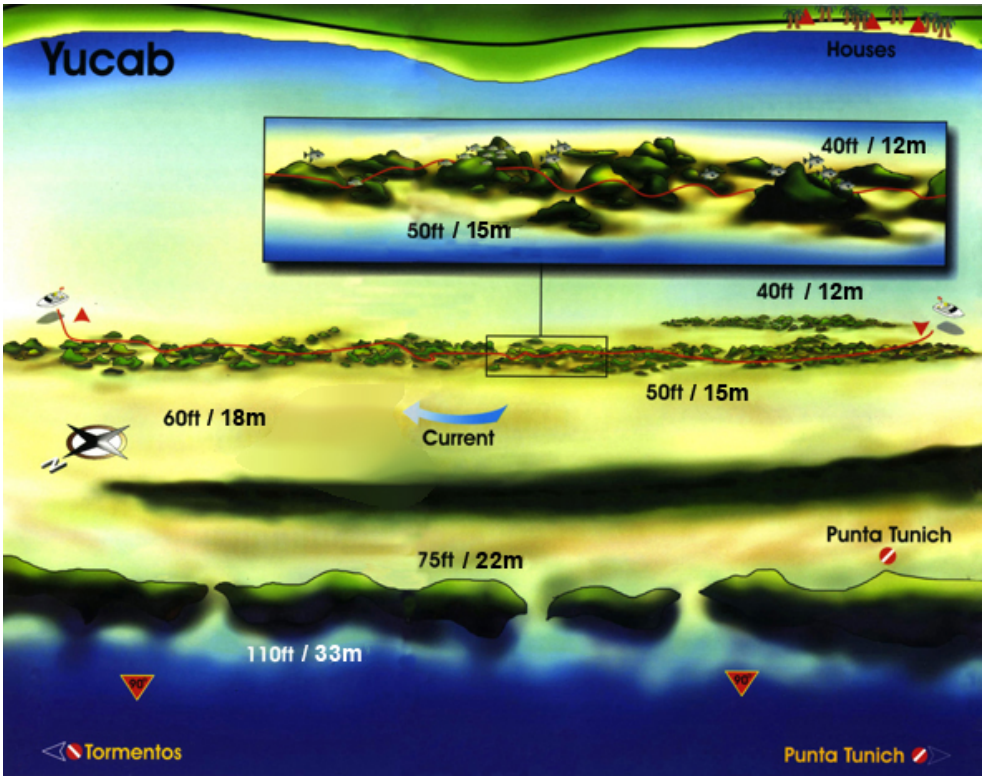
Dive 6: Punta Dalila



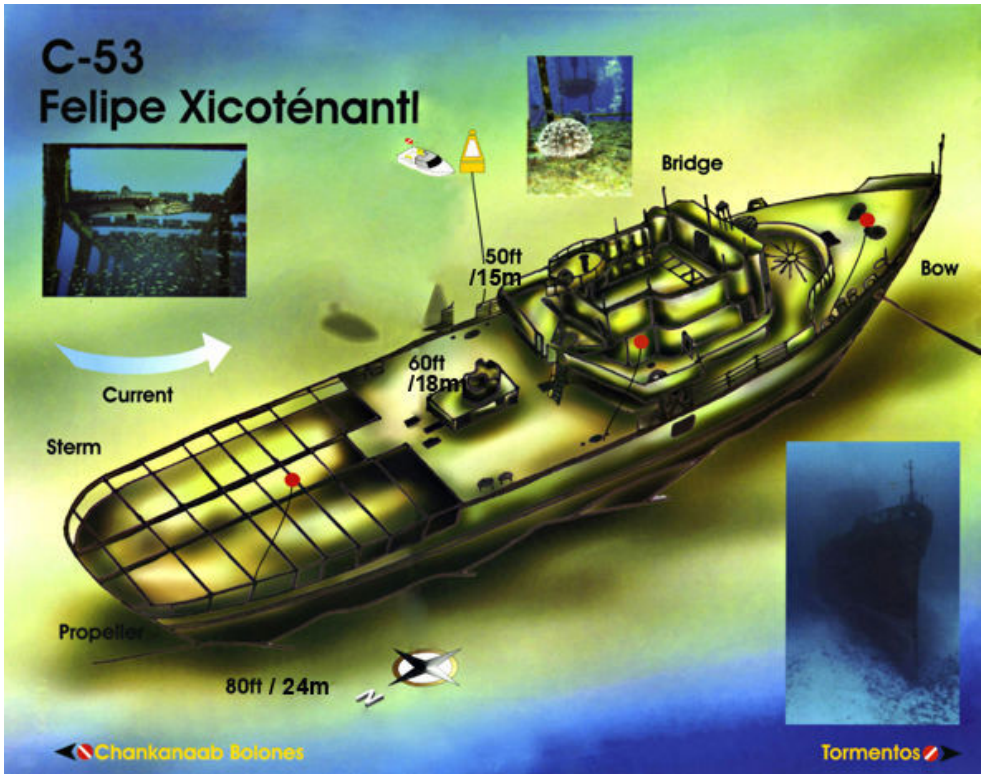
Dive 7: Santa Rosa



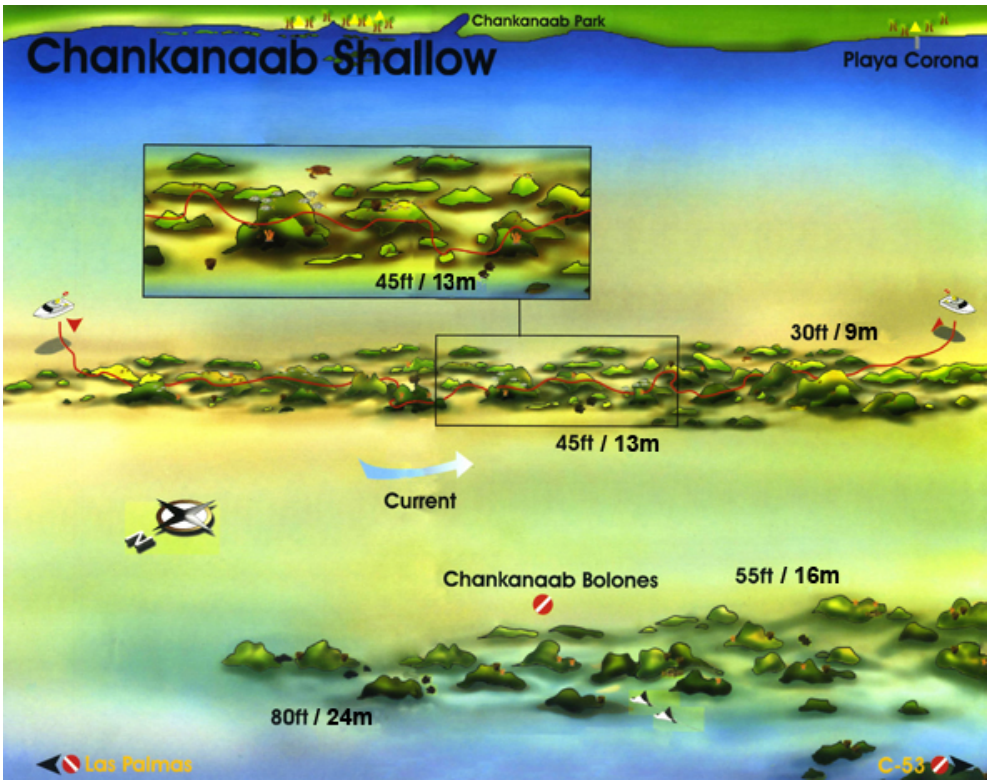
Dive 8: San Clemente



Dive 9: C-53: Felipe Xicoténanti



Dive 10: Chankanaab Shallow



8. Works Cited

Almeida, M.d.R.G., Bell, G.S., & Sander, J.W. (2007). Epilepsy and recreational scuba diving: An absolute contraindication or can there be exemptions? A call for discussion. *Epilepsia, 48(5),* 851 – 858.

Axelrod, P. (1996). Benefits of physical activity for people with spinal cord injuries. *Journal of Rehabilitation Research and Development, 33(1),* vii – viii.

Beauprie, I. (1989). Examining the prospective scuba diver: Which exclusions are proven? *Canadian Family Physician, 35,* 1669 – 1673.

Blinde, E.M. & Taub, D.E. (1999). Personal empowerment through sport and physical fitness activity: Perspectives from male college students with physical and sensory disabilities. *Journal of Sport Behavior, 22(2),* 181 – 202.

Breskovic, T., Denoble, B., Palada, I., Obad, A., Valic, Z., Glavas, D., Bakovic, D., & Dujic, Z. (2008). Venus gas bubble formation and decompression risk after scuba diving in persons with chronic spinal cord injury and able-bodied controls. *Spinal Cord, 46,* 743 – 747.

Cheng, J.F., & Diamond, M. (2005). SCUBA diving for individuals with disabilities. *American Journal of Physical Medicine & Rehabilitation, 84(5),* 369 – 375.

Carin-Levy, G. & Jones, D. (2006) Psychosocial aspects of scuba diving for people with physical disabilities: An occupational science perspective. *Revue Canadienne D'Ergotherapie, 1(74),* 6 – 14.

Dey, I. (1993). *Qualitative data analysis: A user friendly guide for social scientists*. London: Routledge.

Divers Alert Network (2010). Recreational diving fatalities: Workshop proceedings. Retrieved from: www.diversalertnetwork.org/files/Fatalities_Proceedings.pdf on May 7, 2014.

Fleming, N.C., & Melamed, Y. (1977). Report of a scuba diving training course for paraplegics and double leg amputees with an assessment of physiological and rehabilitation factors. *Journal of the South Pacific Underwater Medicine Society*.

Freud, P. (2001) Bodies, disability and spaces: The social model and disabling spatial organizations. *Disability & Society, 16(5),* 689 – 706.

Graczyk, D. (2010). Diving and autonomic cardiovascular system regulation in persons with paraplegia. *Medical Rehabilitation, 14(1),* 17 – 21.

Greenhalgh, D., & Brousseau, R. (2005). Diving for science: Teaching divers with disabilities or adaptive needs. *American Academy of Underwater Sciences, 2005,* 229 – 232.

Kendall, E. & Buys, N. (1998). An integrated model of psychosocial adjustment following acquired disability. *Journal of Rehabilitation, 64(3),* 16 – 20.

Kors, J. (2009). Buoyed spirits: For people with disabilities, scuba diving invigorates body and mind. *Current Science, 95(1),* 6+.

Larner, S. (2005). Common psychological challenges for patients with newly acquired disability. *Nursing Standard, 19(28),* 33 – 39.

Lawton, M.P., & Nahemow, L. (1973). Ecology and the aging process. In C. Eisdorfer, & M. P. Lawton (Eds.), *Psychology of adult development and aging*. Washington, DC: American Psychological Association.

Lundberg, N.R., Taniguchi, S., McCormick, B.P, & Tibbs, C. (2011). Identity negotiating: Redefining stigmatized identities through adaptive sports and recreation participation among individuals with a disability. *Journal of Leisure Research, 43(2),* 205 – 225.

Madorsky, J. (1988). Scuba diving for the handicapped. *Physical Medicine and Rehabilitation, 149(2),* 204 – 205.

Martin, J.J. (2013). Benefits and barriers to physical activity for individuals with disabilities: A social-relational model of disability perspective. *Disability and Rehabilitation, 35(24),* 2030 – 2037.

Moore, K.D., VanHaitsma, K., Curyto, K., & Saperstein, A. (2003). A pragmatic environmental psychology: A metatheoretical inquiry into the work of M. Powell Lawton. *Journal of Environmental Psychology, 23(4),* 471 – 482.

Morgan, T.J., Hansson, R.O., Indart, M.J., Austin, D.M., Crutcher, M.M., Hampton, P.W., Oppegard, K.M., & O'Daffer, V.E. (1984). Old age and environmental docility: The roles of health, support and personality. *Journal of Gerontology, 39(2),* 240 – 242.

Motl, R.W., McAuley, E., Snook, E.M., & Gliottoni, R.C. (2009). Physical activity and quality of life in multiple sclerosis: Intermediary roles of disability, fatigue, mood, pain, self-efficacy and social support. *Pyschology, Health, & Medicine, 14(1)*, 111 – 124.

Mulligan, H. (2011). Health and well being for people with disability: The role of physiotherapists in promoting physical activity. *New Zealand Journal of Physiotherapy, 39(1),* 39 – 45.

Novak, H.F., & Ladurner G. (1999). Scuba diving in neurorehabilitation of Paraplegics. *Rehabilitation, 38(3),* 181 – 184.

Ong, T.F. & Musa, G. Examining the influences of experience, personality and attitude on scuba divers' underwater behavior: A structural equation model. *Tourism Management, 33,* 1521 – 1534.

"Planos de Buceo." *Barceló Maya Diving Center*. n.d. Web. 05 May 2014. Retrieved from: http://barcelo-maya-diving-centre.com/dive_maps_mexico_cozumel.htm

Putnam, M. (2002). Linking aging theory and disability models: Increasing the potential to explore aging with physical impairment. *The Gerontologist, 42(6)*, 799 – 806.

Rimmer, J.H., Riley, B., Wang, E., Rauworth, A. & Jurkowski, J. (2004). Physical activity participation among persons with disabilities: Barriers and facilitators. *American Journal of Preventive Medicine, 26(5),* 419 – 425.

Robinson, J. (1984). Scuba diving: A luxurious mobility experience. *Journal of Rehabilitation, Jan/Feb/Mar,* 57 – 58.

Sturgess, C.E.N., & Clatworthy, M.C. (1981). A scuba diving acquaintance course for the severely disabled. *South Pacific Underwater Medicine Society Journal, 11,* 27 – 31.

Sykes, J.J.W. (1994). Medical aspects of scuba diving. *BMJ, 308,* 1483 – 1488.

Tainsky, A. (1999). Taking a dive: Scuba diving gives persons with MS a taste of high adventure. *Real Living with Multiple Sclerosis, 6(7),* 8 – 9.

Tok, S. (2011). The big five personality traits and risky sport participation. *Social Behavior and Personality, 39(8),* 1105 – 1112.

U.S. Navy Diving Manual (2011). Published by Commander, Naval Sea Systems Command. Retrieved from www.supsalv.org/00c3_publications.asp on May 7, 2014.

Wilhite, B. & Shank, J. (2009). In praise of sport: Promoting sport participation as a mechanism of health among persons with a disability. *Disability and Health Journal, 2,* 116 – 127.